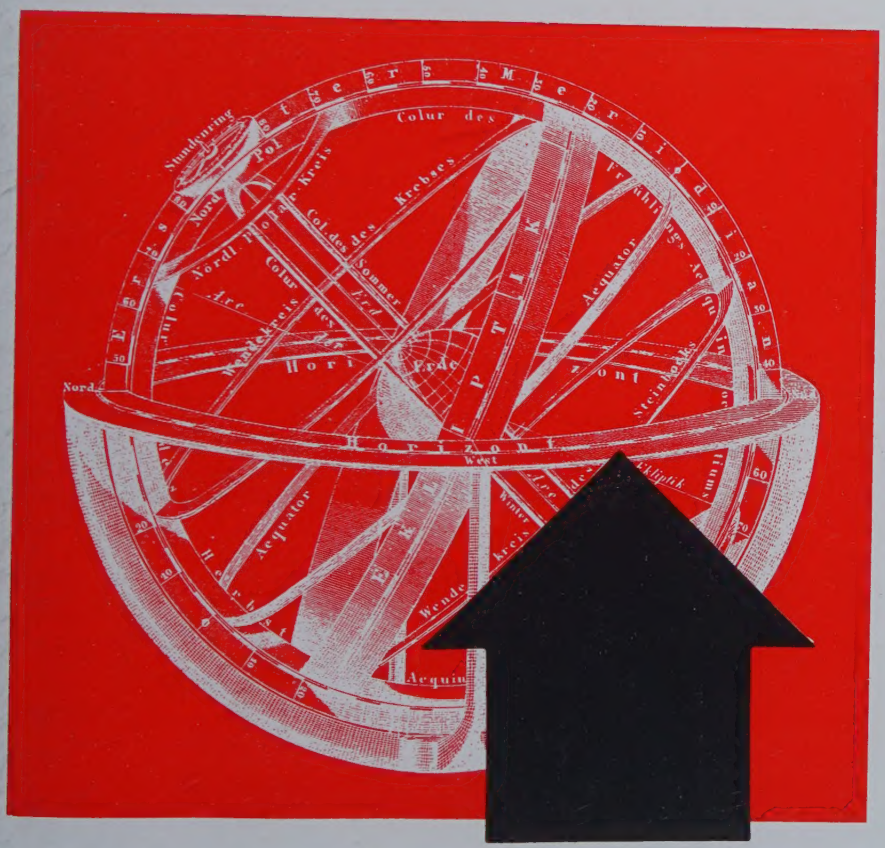
GRAPHIC SCIENCE



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DECEMBER, 1961

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GRAPHIC SCIENCE

DECEMBER, 1961

THIS ISSUE 13,500 COPIES

VOLUME 3 NUMBER 12

The Magazine Serving Engineering Drawing Management—covering drafting, reproduction and microfilming, technical illustration, drawing standards and engineering documentation.

ARTICLES

DEPARTMENTS

Next Month

DRAFTING PRODUCTION AND EFFICIENCY CAN BE MEASURED
by Stanley Mattes
How efficient is the drafting department? How much is it producing? Supervisors need the answers for accurate planning, scheduling and control. Here is a method that gives the answers quickly and cheaply.

ENGINEERING DRAWING CHANGE CONTROL by James C. White
The impact of accelerated defense production, research, and development requires new and revised procedures and practices in the drafting department.

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Letters

A Drawing by Any Name

Sirs:

In the article "Drawing Titles According to MIL-STD-28" (*Graphic Science,* October, 1961), Mr. Mortimer has well stated the difficulties in attempting to follow this standard.

It is true that Federal Cataloging Handbook H6-1 is "not utopia," but when used as a guide for giving titles to non-H6-1 items, it serves a very good purpose and is a far better method than trying to follow MIL-STD-28. We have been using H6-1 in this manner for over five years and find it very adequate.

C. L. WHITE

Federal Cataloging Unit Head
Lear, Inc., Instrument Div.
110 Ionia Ave., N.W.
Grand Rapids 2, Mich.

Cost Control

Sirs:

I want to thank you for sending me the *Graphic Science* publication which is highly useful in our daily work.

At this time I also want to take the opportunity to compliment you for the high class of authors you have for your excellent articles. One of the best and most brilliantly written was the article" Cost Control in the Drafting Room" by E. R. Wattsjer, published in the October issue of your magazine, and which has been most helpful to our drafting department.

I wish you good luck in your work in the future, and in my opinion this should be no problem with the high standard of your magazine.

ERIK A. ATTERLING

Chief Telephone Engineer
Kellogg Manufacturing Co.
Scott & Davis Sts.
Corinth, Miss.

Sirs:

I read with a great deal of interest the article "Cost Control in the Drafting Room" by E. R. Wattsjer of the Joy Mfg. Co. in your October issue. His many comments in this article are well founded. One can tell from this article that he is a man with a great amount of experience.

While I enjoy reading your articles each month, ones on this subject are of most interest to me.

I am looking forward to seeing similar articles in future issues.

W. ALBRECHT

Brooklyn Prod. Engr. Dept.
American Machine & Foundry Co.
5502 Second Ave.
Brooklyn 20, N. Y.

Draftsmen's Society

Sirs:

Several months ago you published an excellent article on the need for a Professional Drafting Society. There have been, as you indicated, many attempts to formulate such a group and all have for various reasons failed. It is not my intention to discuss those failures, but to announce the formation of a group of clubs born of the failure of one prior organization.

From the ashes of the aforementioned group that originated seven years ago, there now has emerged a concept dedicated by and for draftsmen.

We welcome all inquiries as to our organization. We welcome all groups that are already formed, and we would be more than happy to communicate with them about affiliation. We are glad to exchange all our material and ideas.

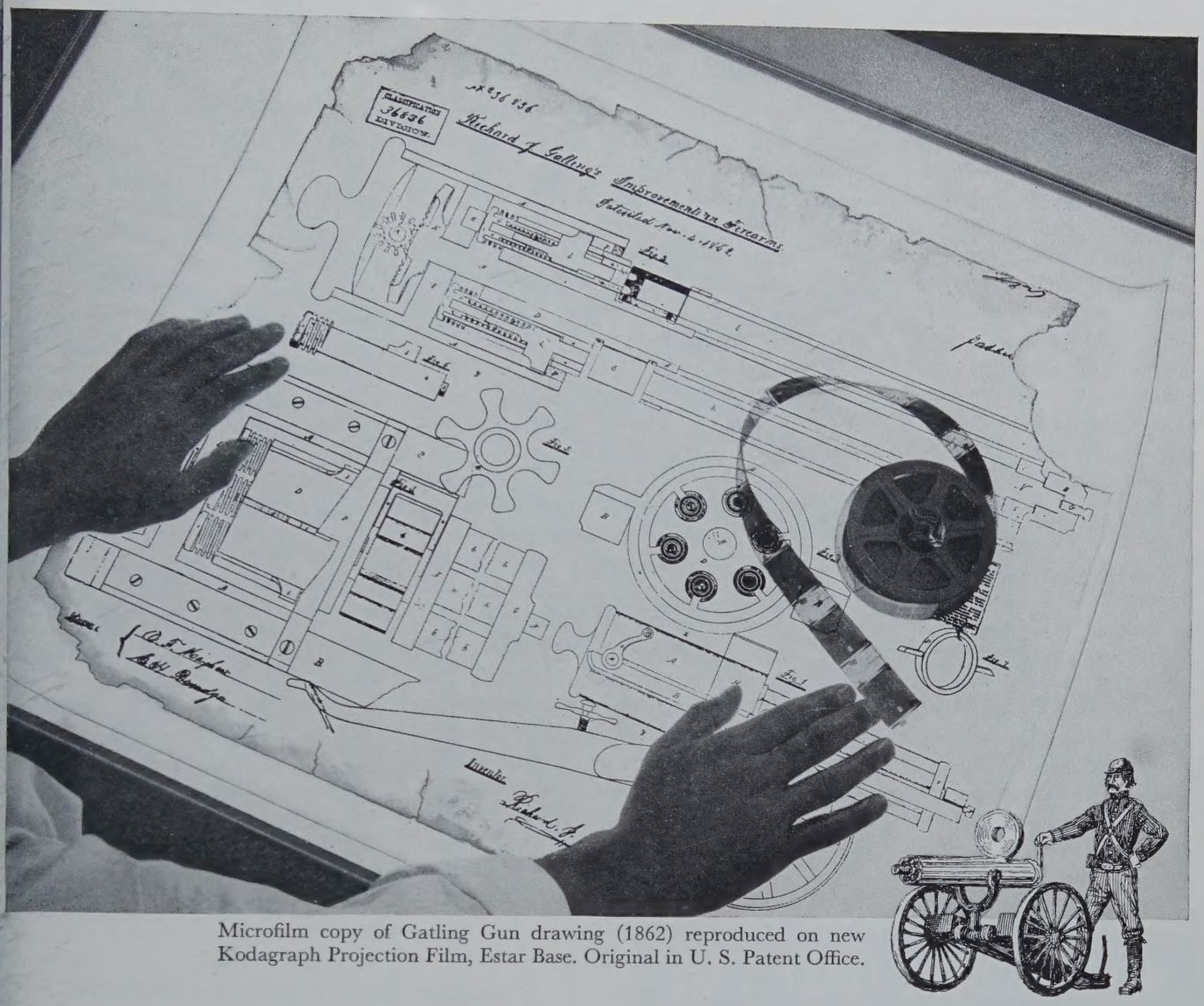
We stand ready to assist any who might desire to start a club under our standards, and will give whatever necessary advice and programming is needed to put such a club on a good firm foundation.

Please address inquiries to the address below.

THEODORE S. GOHRS
Director

Professional Draftsmen's Society
P. O. Box 737
Oklahoma City, Okla.

Your comments are welcome. Address your letters to Editor, Graphic Science, Wilton, Conn.



Microfilm copy of Gatling Gun drawing (1862) reproduced on new Kodagraph Projection Film, Estar Base. Original in U. S. Patent Office.

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Notes & Comment

Visit VCC in LA

THE VISUAL COMMUNICATIONS Congress, in its fifth year, meets in Los Angeles on December 2, 3, 4, and 5. It is well known as the best display ground for quality equipment, techniques, and supplies, and this year it will attract more than 8,000 quality executive personnel in administration, reproduction, design, and documentation from every state in the union, as well as Canada, Mexico, South America, Europe, and Asia.

The Congress will be of three-fold interest to us in the drafting and reproduction field. Jointly sponsored by the Society of Reproduction Engineers, the American Institute for Design and Drafting, and the American Records Management Association, its program includes a technical session with panel discussions on various subjects of vital interest in the field; the annual national meetings of the three societies; and the exhibitions by manufacturers and distributors of products related to drafting and reproduction.

Graphic Science plans to be there of course, and we are hoping to see many old friends, and make many new ones, at our booth—#223. See you early in December.

Microfilming Seminars

ONE-DAY SESSIONS covering an explanation of available microfilming techniques, analysis of new military regulations on microfilming, and demonstration of microfilming systems and procedures will be conducted by Hanley L. Riess, Engineering Coordinator of Litton Industries, Inc., Potentiometer Division. The seminar is scheduled to appear in Los Angeles on December 1, Denver on December 4, Cleveland on January 18, and Chicago on January 19. For complete information on the program, write Industrial Education Institute, 221 Columbus Ave., Boston 16, Mass.

Do Photodrawings Stifle Creativity?

THE NOTION that photodrawings curtail creative talent is categorically rejected in the latest issue of *The Kodak Compass*.

Photodrawings, the 12-page article emphasizes, supplement rather than replace ordinary engineering drawings by eliminating much of the tedious, time-consuming redrafting involved in making changes. The article points out that the photodrawing concept, although not new, is just beginning to take hold, and that future applications are limited only by the imagination. The article gives a comprehensive report on the photodrawing process—what it is, its purpose, its advantages as a time- and money-saver, and how it is accomplished.

The Kodak Compass is published three to four times a year and deals primarily with the "how-to" phase of industrial reproduction. Copies may be obtained free by writing Eastman Kodak Co., 343 State St., Rochester 4, N. Y.

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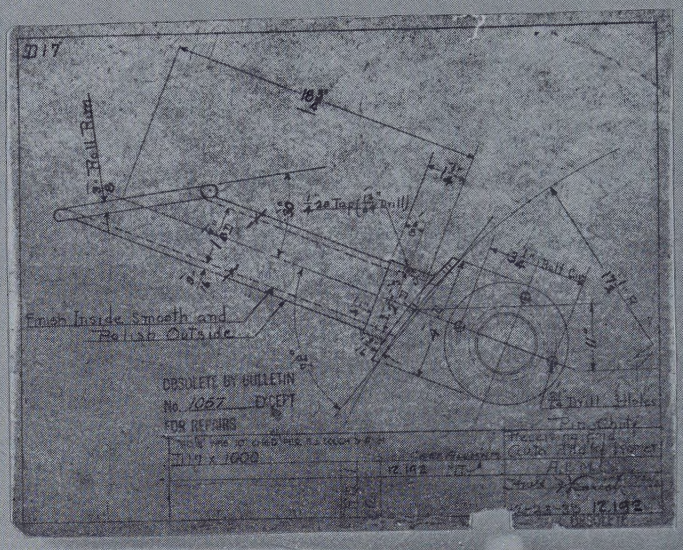

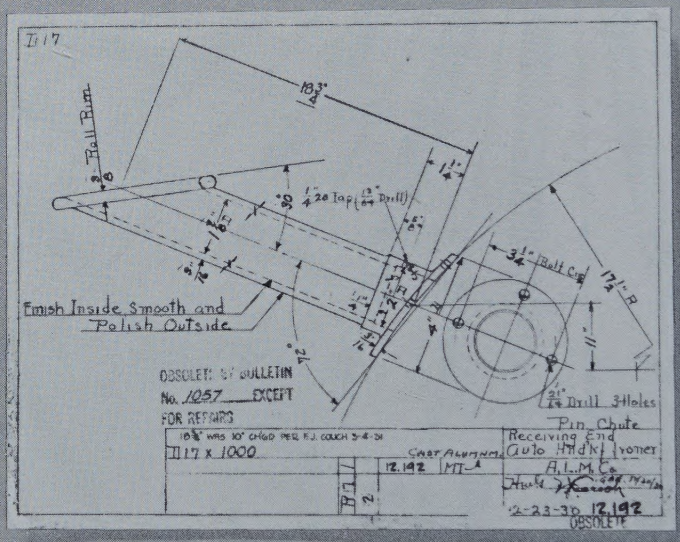

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GRAPHIC SCIENCE

DECEMBER, 1961
VOLUME 3 NUMBER 12

True Position Dimensioning Explained

Many companies are missing the benefits of this method of dimensioning because of a misconception that it is complicated to use and interpret

by W. L. Wein

TRUE POSITION dimensioning may be defined as a method which stablishes the theoretically exact cation of features by the use of ntoleranced dimensions. A tolerance then given stating the amount that ch feature may vary from the true sition.

Although true position dimensiong has come into fairly widespread se in recent years, there still seems be a tendency on the part of some ctions of industry to regard its use ith suspicion, if not actual distrust. he military, on the other hand, cognizing the many advantages inerent in the use of true position mensioning, have been instrumenl in effecting its use on military ntracts that include preparation of gineering drawings. MIL-STD-8 3)—Dimensioning and Tolerancing evotes considerable attention to ue position dimensioning and its terpretation.

Possibly some of the reluctance to cept true position dimensioning is e fault of some of its proponents. any of the published items on this topic give the impression that here is an exotic type of dimensioning, complicated both in use and interpretation. Nothing could be further from the truth.

True position and coordinate dimensioning are actually very similar. Both are derived in basically the same way, making use of the allowance between mating parts. Coordinate dimensioning does have several disadvantages, however, that are eliminated by using true position. The advantages of true position will be discussed later.

Standard coordinate and angular dimensioning usually state the desired dimension with the applicable tolerance adjacent to the dimension. There is an ideal dimension that the designer would prefer to have held perfectly if possible. Since this is not possible, we have a tolerance. Thus with a 2.00 ± .010 dimension between two points the ideal, perfect, or true dimension is 2.00. This ideal dimension is the one specified in true position dimensioning.

Except for circular features, there are only three differences between standard and true position dimensioning.

They are:

1. In true position dimensioning the tolerance is not given adjacent to the dimension. Each dimension should have the word "basic" written under or to the right of it to indicate that it is a true position dimension. The tolerance is then given either in a note or in a block with the symbol for true position.
2. In true position dimensioning the tolerances are not cumulative as they are in other types of dimensioning. The basic or true position for each feature is given. The tolerance stated in the note or block specifies the amount that each feature may move from its true position.
3. The geometry involved in establishing the true position is perfect. All lines drawn perpendicular to one another and used to establish the true position of a pattern are interpreted to be at an angle of 90° ± 0°.

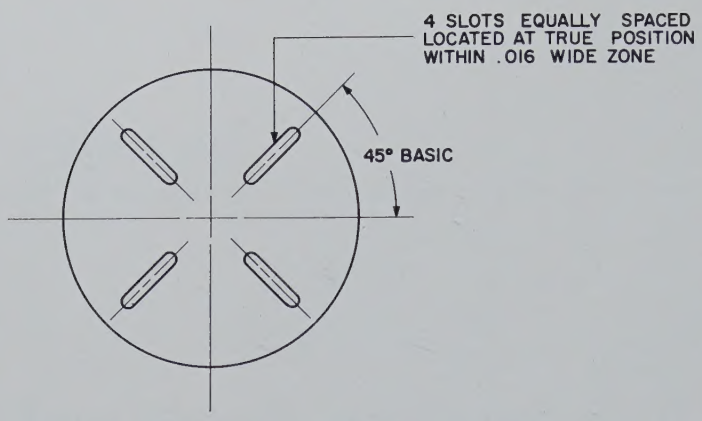


FIGURE 1

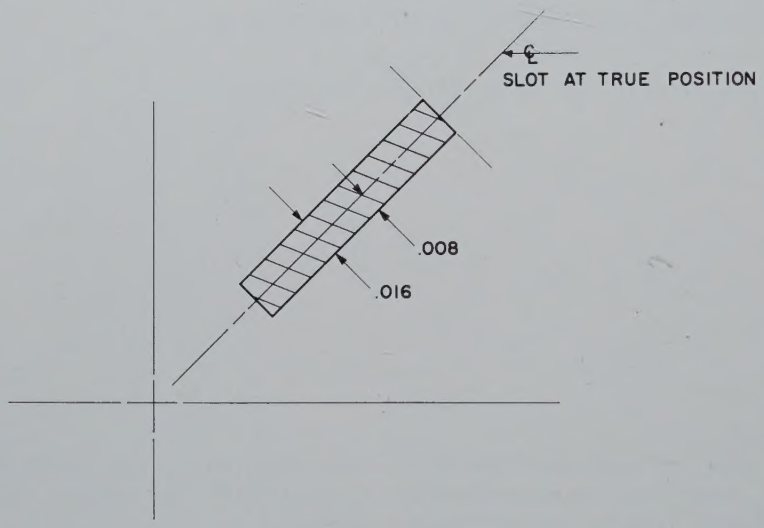


FIGURE 2

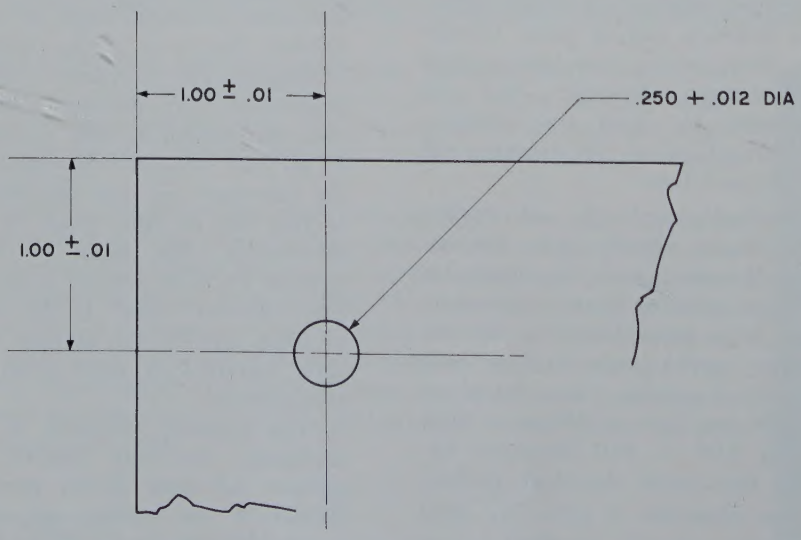


FIGURE 3

All tolerances specified in connection with true position tolerancing are totals. Fig. 1 shows the location of four slots in true position.

Fig. 2 shows the tolerance zone for the center line of each slot. It should be noted that the true position tolerance is for angular location only. The distance from the center or edge of the piece to the slot may be given as a standard toleranced dimension.

Next let us consider dimensioning circular and cylindrical features by true position methods. Fig. 3 illustrates the major difference between coordinate dimensioning and true position dimensioning of circular features.

The tolerance zone for the center line or axis of the hole shown in Fig. 3 is given in Fig. 4.

It may be seen at once that the largest permissable variation for this tolerance zone would be across the two diagonals. Elementary calculation will reveal the variation to be .028. This indicates that we are allowing a variance of .028 across diagonals, but only .020 vertically and horizontally. The evident inconsistency provides the basis for the circular true position tolerance zone. If .028 tolerance can be allowed across diagonals, there is no reason why it cannot be allowed in all directions, as in Fig. 5.

For cylindical features the circular tolerance zone will allow 57% greater tolerance than the square tolerance zone and will permit the use of simple receiver gages to inspect for the least favorable assembly condition.

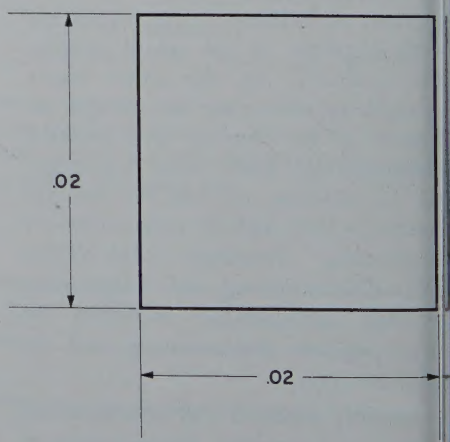


FIGURE 4

Fastening Arrangements

Let us now consider in detail the calculation of true position tolerances in fastening members together. This is basically a consideration of mating parts (pins or screws and their clearance holes) and represents a major use of true position dimensioning. There are other applications and the approaches described here may be applied generally.

In general there are two types of fastening systems used to connect or join parts. One type has a clearance hole in all clamped members with screws or bolts accomplishing the clamping. This is usually called a floating fastener arrangement. The other type of fastening system has tapped holes in, or threaded studs projecting from, one of the clamped members, with clearance holes in the other members. This is called a fixed fastener arrangement.

The maximum material condition of both the fastener (screw, pin, or bolt) and the clearance holes in the members to be fastened should be used in calculating true position tolerance. Maximum material condition is the most amount of material—that is, the largest pin diameter and smallest hole diameter. Use of the maximum material condition in calculating tolerance will assure the parts fitting together even at the worst possible conditions.

True position tolerance for a floating fastener arrangement (both members with clearance holes) may be calculated using the following formula for each member.

.XXX dia.—Maximum material condition (MMC) of hole
Less—.YYY dia.—Maximum material condition (MMC) of fastener
.ZZZ dia.—True Position Diametral Tolerance

If all clamped members have the same size clearance holes at MMC for the fastener, the true position tolerance would be the same for each member.

It is very important to note that this true position for each member may be totaled for two parts being clamped, and this total true position tolerance may be divided between the two clamped parts as best suits the particular situation.

An example will best illustrate this formula. To find true position tolerances for a floating fastener arrangement with 2 members:

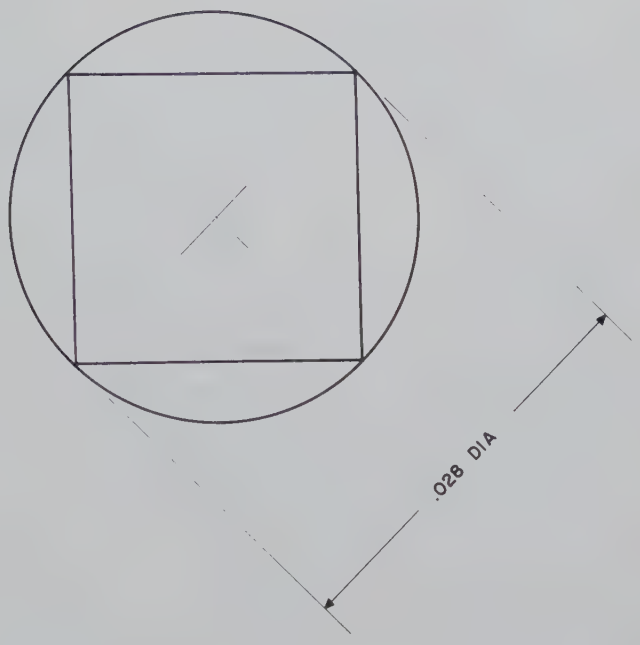


FIGURE 5

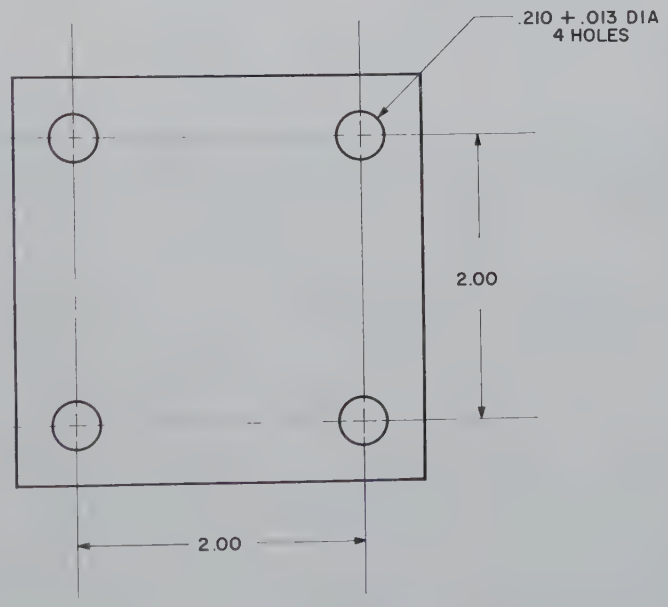


FIGURE 6

Bolt two plates together, with clearance holes in each plate. The plates shall be fastened with four #10 screws on 2" centers. Dimension the holes in each plate using true position. For clearance holes use .210 + .013 dia.

Using the formula above we obtain the true position tolerance for one member.

.210 dia.—MMC of clearance hole
Less—.190 dia.—MMC of #10 screw
.020 dia.—true position tolerance

Since both plates have the same size clearance holes, the end plate has a true positional tolerance of .020 for each of the four holes. Thus a total true position tolerance available to the plates is:

Plate No. 1—.020 dia.
Plate No. 2—.020 dia.
.040 dia.—total tolerance available

This .040 dia. total tolerance may be divided between the two plates in

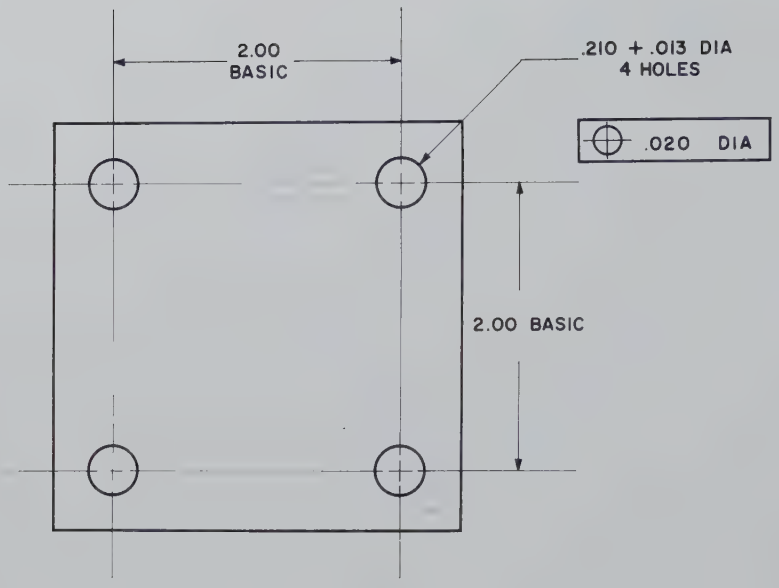


FIGURE 7

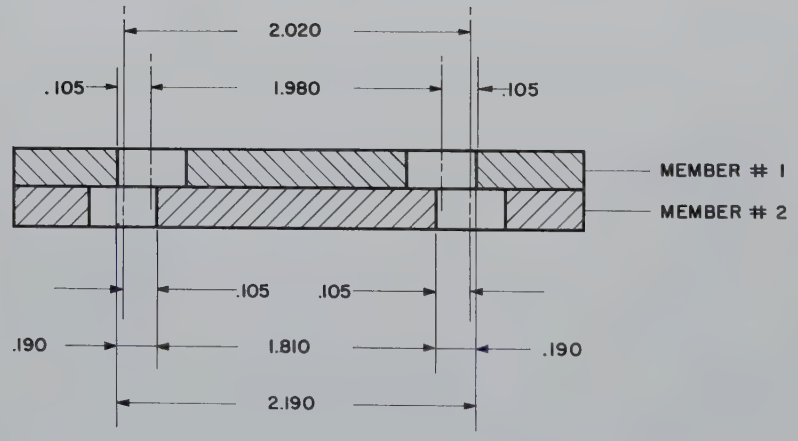


FIGURE 8

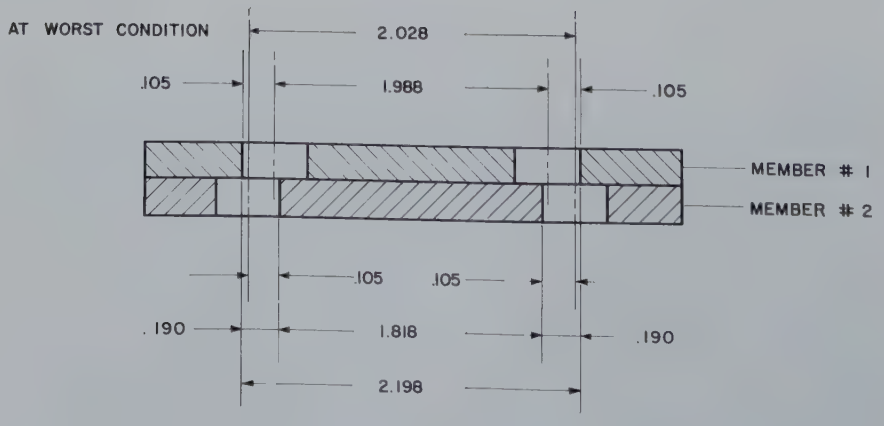


FIGURE 9

any manner desired. If there were no unusual circumstances, the tolerance of .020 dia. would be given the holes in each plate.

Assuming that the tolerance was divided equally, each member would be dimensioned as shown in Fig. 7.

A check to ascertain that the two numbers can be assembled at the worst possible condition may be made as shown in Fig. 8. Holes are at MMC (.210 dia.).

It is apparent that #10 screws (.190 dia. MMC) will fit through holes of both members at the extremes of tolerance. Proof that the total true position tolerance may be divided between the two numbers in any manner desired may be shown by the following. Using the same holes and screws as shown in Fig. 7 the total available tolerance as shown above is .040 dia.

Member #1 will be given true position tolerance of .028 dia.
Member #2 will be given true position tolerance of .012 dia.

Total available tolerance .040 dia.

It has been shown that two members in a floating fastener arrangement may have the total true position tolerance divided between them in any manner desired. When calculating true position tolerance for a floating fastener arrangement of more than two plates, it is not true that this total true position tolerance may be divided in any manner desired as is the case with two plates. The total true position tolerance must be divided so that the total true position tolerance between any two of the plates does not exceed the maximum calculated for these two plates.

For this reason, with more than two plates in a clamping arrangement, it is usually desirable to assign the tolerance calculated for each plate to that plate and not reassign tolerances.

True position tolerance for a fixed fastener arrangement (one member with clearance holes, the other tapped or has studs) may be calculated using the following formula for the member with clearance holes:

.XXX dia.—Maximum material condition (MMC) of hole
.YYY dia.—Maximum material condition (MMC) of fastener

.ZZZ dia.—True Position Tolerance

In the case of a fixed fastener, there is no true position tolerance

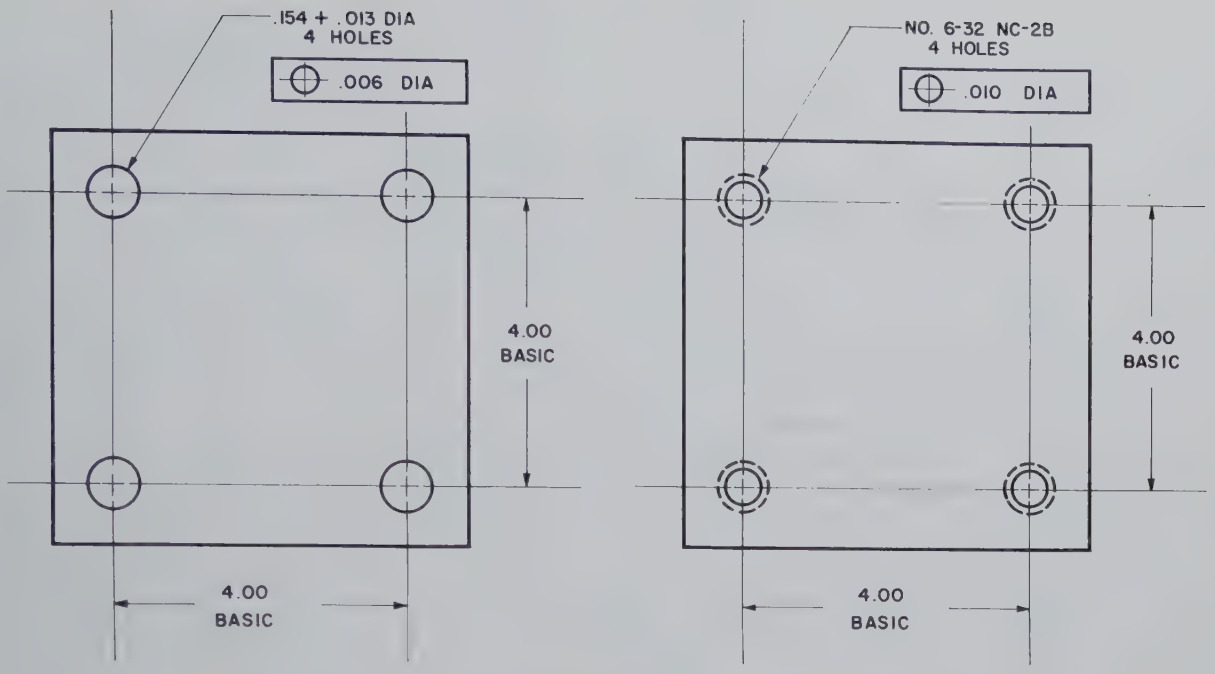


FIGURE 10

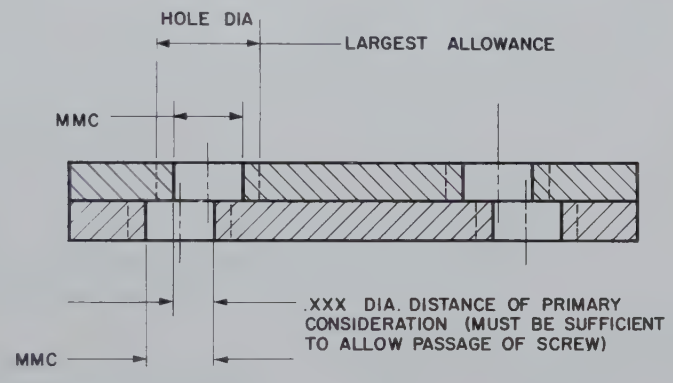


FIGURE 11

available for the tapped member itself, since there is no clearance hole with allowance. The true position tolerance calculated for the member with clearance hole (as above) is the total available tolerance and must be shared with the tapped member.

As stated in the case of the floating fastener, the total true position tolerance may be divided between the two clamped parts as best suits manufacturing needs. Generally, the true positional tolerance on the member with the tapped holes should be larger than the tolerance on the member with clearance holes because of the difficulty of holding close tolerances between tapped holes.

Problem—Finding the true position tolerances for a fixed fastener arrangement (2 members, 1 with tapped holes):

Two machined members are to be clamped together. One member is tapped for four #6 screws on 4" centers, the other member has clearance holes. Dimension the holes in each member using true position.

For clearance holes in the one member use .154 + .013 dia.

Using the formula for fixed fastener arrangements stated in the above paragraphs, we obtain the available true position tolerance.

.154 dia.—MMC of clearance hole
.138 dia.—MMC of #6 screw

.016 dia. Total True Position Tolerance

This .016 dia. true position tolerance must be shared between the two clamped members. Since it is more difficult to hold a close tolerance on a tapped hole, the tapped holes should generally be given 60-70% of the available tolerance. The exact distribution will have to be divided based on the particular design being dimensioned.

Total tolerance available .016 dia.
Use—for the tapped member—.010 dia.
for the clearance holes—.006 dia.

Thus the members will be dimensioned as shown in Fig. 10.

If three or more parts are clamped together (one with tapped holes), the total true position tolerance between any member with clearance holes and the tapped member cannot exceed the true position tolerance available for that member with clearance holes.

From the formulas and examples it may be seen that enlarging the clearance hole will result in a larger available true position tolerance.

The true position tolerances that have been calculated in the preceding examples were calculated when the features (in this case clearance holes) were at their maximum material condition. This worst condition must be assumed since there is no

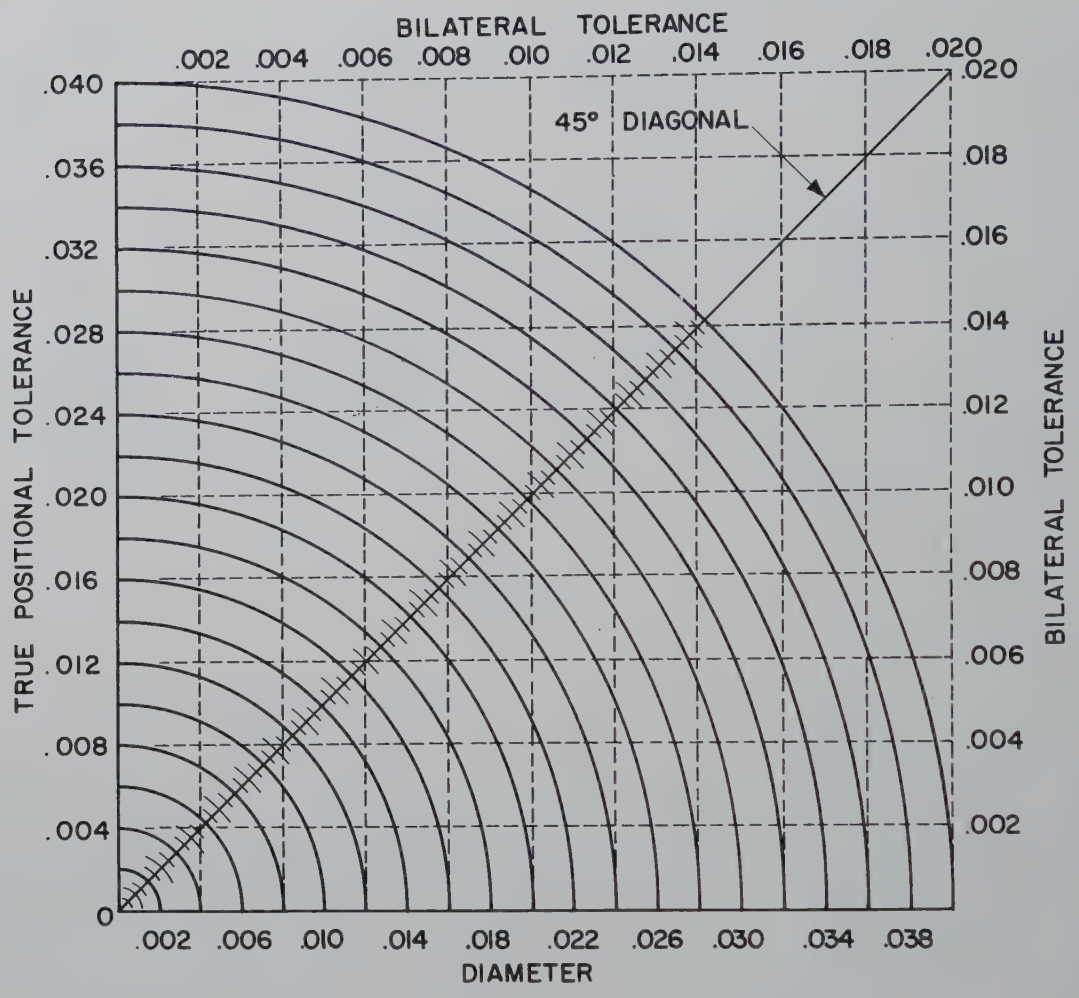


FIGURE 12A

guarantee that the holes drilled in the actual members will not be as small as possible within the tolerance given. Usually the primary concern is that the members being clamped will allow the required bolt or screw to pass through their clearance holes. Therefore, as the clearance holes in the actual parts depart from maximum material condition, additional locational tolerance is permitted. Such added tolerance is equal to the difference between maximum material condition and the actual size of the holes. This is one of the most important advantages in using true position dimensioning.

This condition is shown pictorially in Fig. 11. As the two clearance holes increase in size or depart from MMC, additional displacement of the holes is allowable and the .XXX dia. would still be maintained.

A simple receiver gage will automatically take this additional tolerance into account, and for some time the general opinion was that true position tolerancing could only be used in conjunction with gages. While it is true that gages do facilitate the inspection of features located in true position, it is by no means an absolute necessity to have gages before true position tolerancing can be used. There are many times when the advantages of true position dimensioning justify its use when there are no gages to check the part. Fig. 12A illustrates a conversion chart that may be used to inspect a part, using a coordinate dimensional check and then converting to true position. An example is also shown demonstrating its use in Fig. 12B. Several other conversion charts and methods are currently in use, all of them quite satisfactory.

In the majority of cases, more tolerance is allowable from the datums locating a group of holes in true position than can be permitted between the holes themselves. Coordinate dimensions with tolerances are then given from the datums to the group of holes. It must be remembered that this dimension with tolerance is not actually locating the holes in the part, but establishes a tolerance zone for the true position centers. An example, shown in Figs. 13A and 13B, best illustrates this principle.

The .50 ± .02 dimension establishes a tolerance zone within which the true centers of the true position tolerance zones must be. The geometry involved in establishing these true centers is perfect so that the relation of actual holes in the part (assuming they are within specified tolerance), one to the other, will always be within the true position tolerance. One possible condition of the tolerance zones for the four holes is shown in Fig. 13B.

A careful study of Fig. 13 will show that it would be possible for a hole in the actual piece to be within .475 of the edge or within .525 of the edge and still be acceptable.

The sides of the example in Fig. 13B have been numbered for identification. Referring to the dimensions shown in Fig. 13A it is apparent that the two datums used in locating the four holes are at sides 1 and 4. Where the datums are obvious they need not be specified and are usually known as implied datums. In Fig. 13A the only implied datums are sides 1 and 4. While it is possible for sides 2 and also 3 to be specified as datums, they are never implied datums. When it is desired to specify datums, the datums themselves should be indicated on the drawing as shown in Fig. 14.

When specified in Fig. 14 the datums must then be referred to within the true position control block as shown in the same figure.

When datum C is specified in Fig. 14, the requirement is that the four holes must not only be parallel to datums A & C within the .010 dia. true position tolerance for their entire length, but must also be perpendicular to datum C within .010 for their entire length.

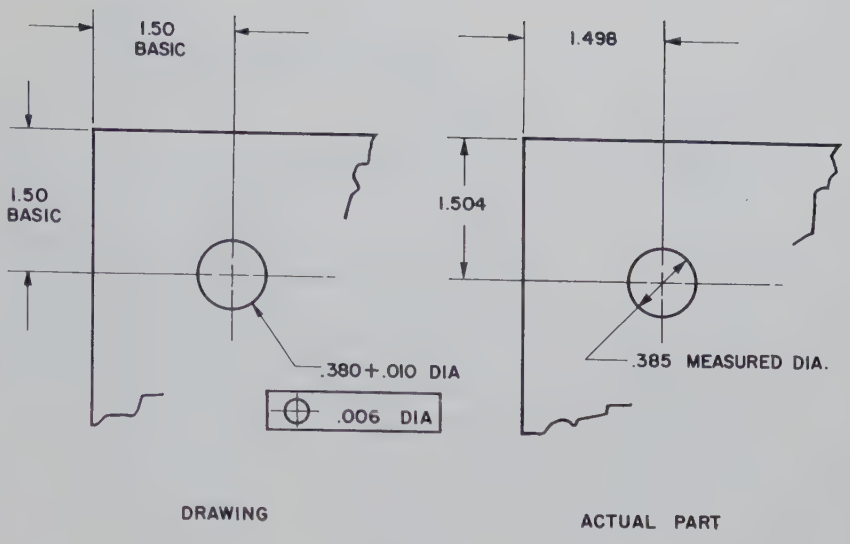


FIGURE 12B

The actual part varies horizontally from the basic dimension .002
The actual part varies vertically from the basic dimension .004
Read .002 on the upper bilateral tolerance and .004 on the side bilateral tolerance of the chart. (The readings may be interchanged. It makes no difference which reading is on top or side). Follow both readings until the lines meet at one point.
The actual location of the hole may be read on chart as true position within .009 dia.
Since the measured diameter is .385, additional tolerance is available.
Formula for additional tolerance as hole departs from maximum material condition:

Actual dia. of hole	– .385	
MMC of hole	– .380	
	.005	additional tolerance
Drawing gives	.006	dia.
	.005	additional tolerance
	.011	dia. total true position tolerance available for hole.

Since the actual hole is in true position within .009 it is acceptable.

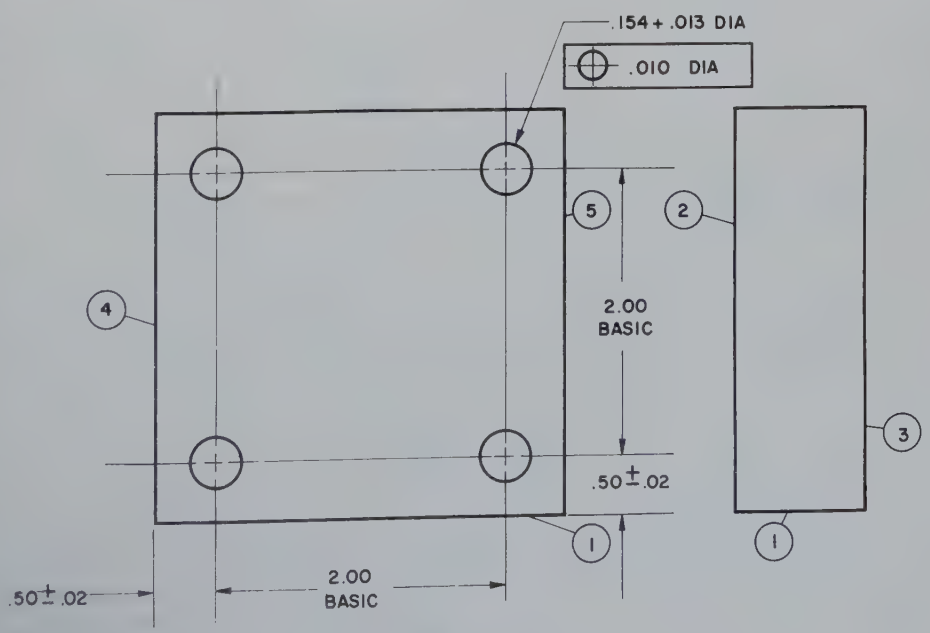


FIGURE 13A

Six Advantages

The descriptions, definitions, and examples illustrated here have given a brief explanation of true position dimensioning. There are many companies today who could be realizing the benefits of this method of dimensioning, yet are reluctant to adopt it. To the responsible individuals within these companies, we submit the following advantages of true position:

1. For cylindical features (holes, bosses, etc), the circular tolerance zone will allow 57% greater manufacturing tolerance than a square

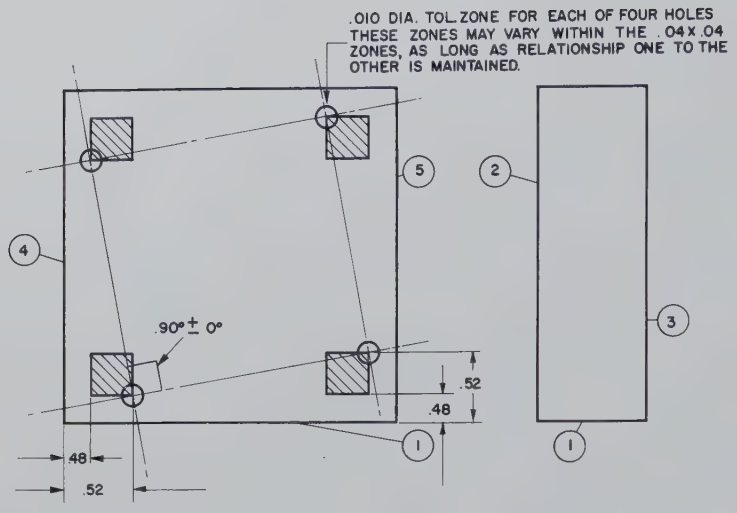


FIGURE 13B

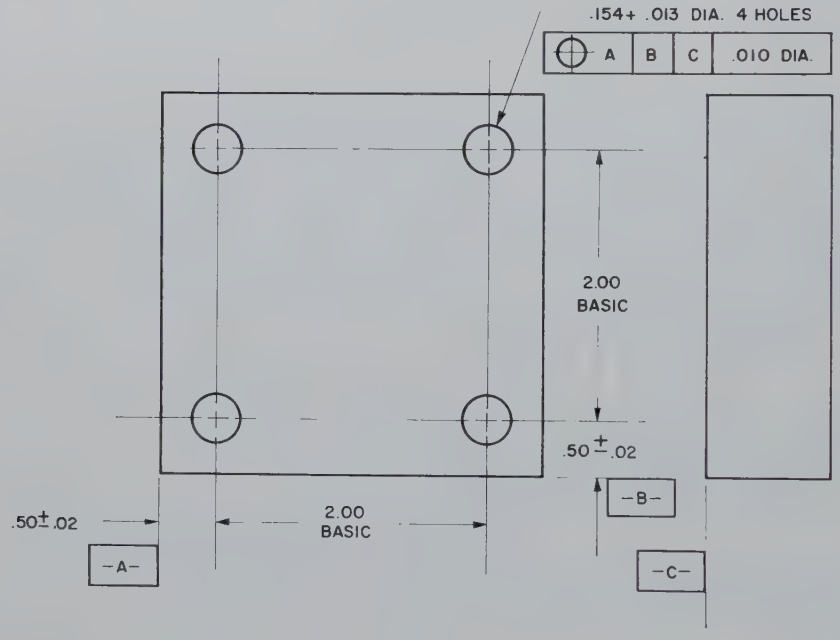


FIGURE 14

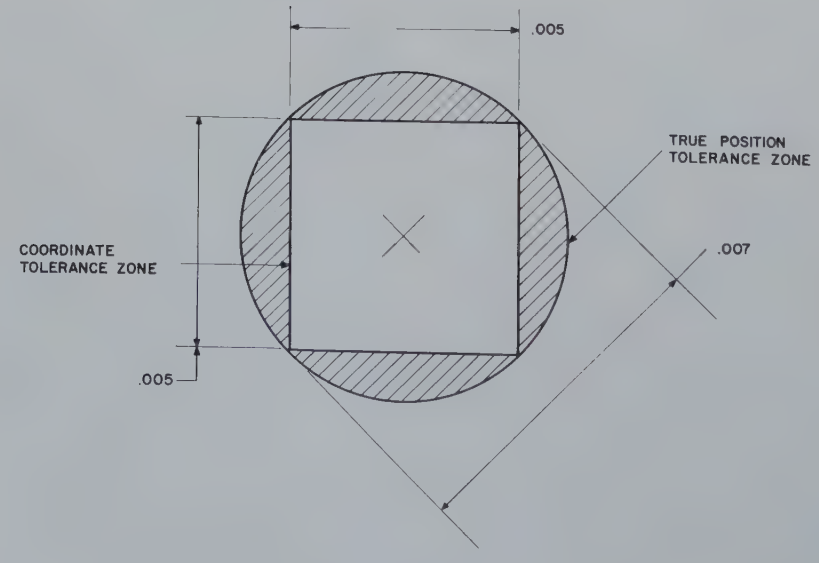


FIGURE 15

tolerance zone and will permit the use of simple receiver gages to inspect for the least favorable assembly condition. (Fig. 15).

2. The exact total permissible tolerance for each hole is immediately evident; there is no accumulation of tolerances from hole to hole.

3. Extensive use of fixed type receiving gages is not a prerequisite to derive the benefits of true position dimensioning. By the use of a simple conversion chart (see Fig. 12) the coordinate measurements can be made on the actual part and converted to true position equivalent.

4. True position merely utilizes the permissible diagonal tolerance of coordinate dimensioning, and allows this same tolerance in all directions.

5. The true position requirement is at maximum material condition. Therefore, when the feature is at other than its maximum material condition, but within its limits of size, additional locational tolerance is permitted. This additional tolerance is equal to the difference between MMC and the actual size of the hole.

6. The allowable tolerance zones for mating parts is much simpler for draftsmen to calculate when true position is used.

The Author

W. L. Wein has had experience as draftsman, designer, supervisor of drafting, and technical specialist in production engineering. He is now a specialist in drafting standards for the Missile and Armament Section, Missile and Space Vehicle Dept., General Electric Co., Burlington, Vermont, and is responsible for drafting and design standards and practices. A member of the Defense Electronics Division Standards Advisory Group within General Electric, and an active member of the American Ordnance Association, serving on the General Drafting and Dimensioning Committee and on the Drafting for Tape Controlled Machining Committee within AOA, Mr. Wein also gives a course in technical drafting for students at the Burlington Senior High School in the joint industry-educational program under the National Defense Education Act.

Evaluating Electrical Construction Drawings

Getting drafting economies without losing needed information requires a careful examination of the function of the drawings

by Charles W. Snow

MANY ARTICLES and publications today discuss the theories of drafting cost reduction. We hear of functional drafting and simplified drafting, and of the methods drafting supervisors are using to effect these changes. A spirit of housecleaning is being felt in drafting rooms everywhere, and this is as it should be, for certainly this tradition-bound field has developed many frills which need to be swept away. However, as with many housecleaning campaigns, we should be careful to see that something of value doesn't get swept up in the dust. A happy medium is the hope of the drafting room campaigners and this can only be accomplished by wise and discerning people.

At Jackson & Moreland, Inc., a Boston firm of consulting engineers, we too have been striving to reach the happy medium. In the electrical division when a new project is initiated, and a drawing list is prepared, we examine first the need for each and every drawing. This requires careful thought because electrical drawings for a construction project must fulfill more needs than the obvious one of furnishing the design by which to build. Reduced to four simple categories, they must (1) develop the engineering concepts and keep them current, (2) inform the client of the project development for ap-

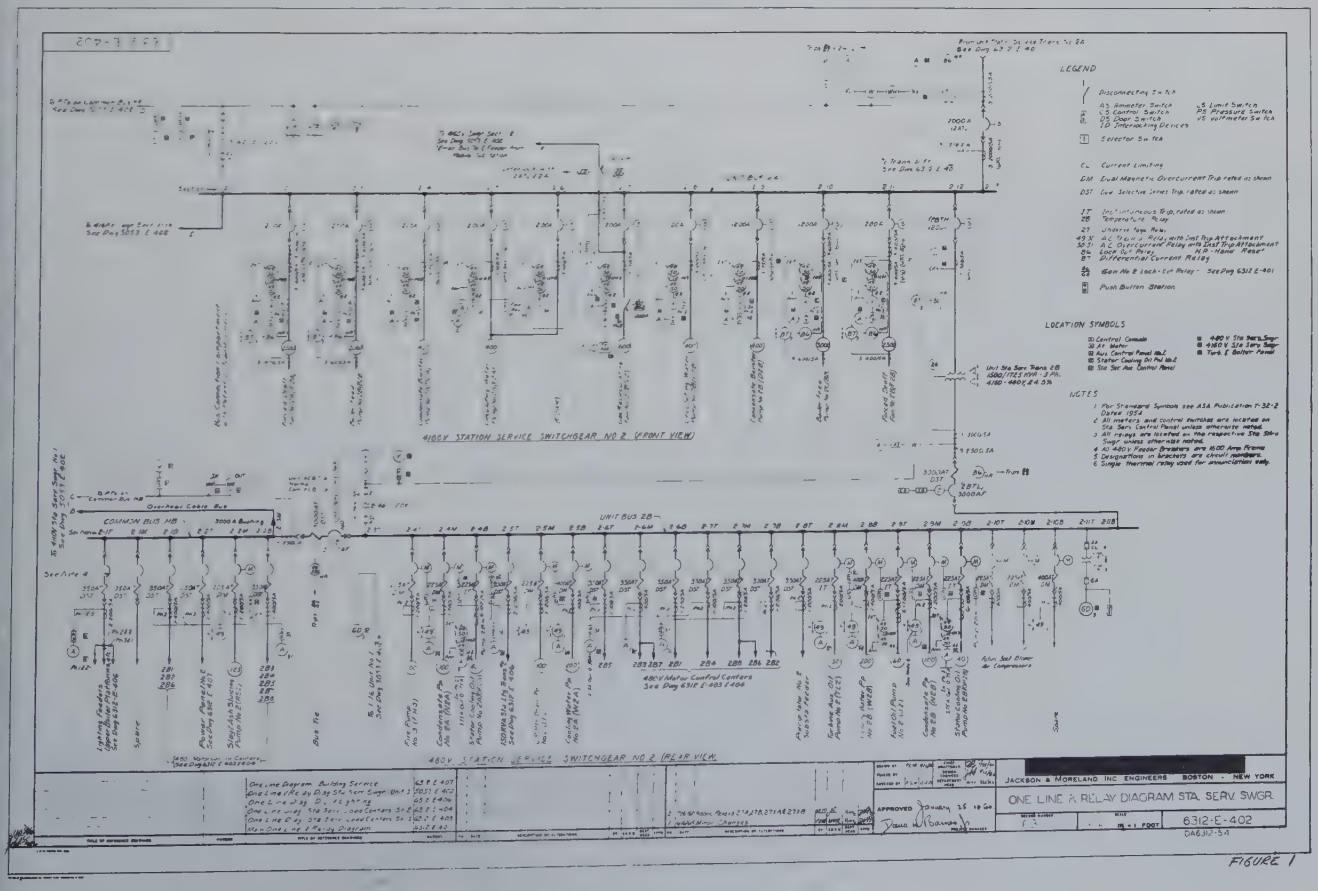


FIGURE 1. One-line diagram incorporates basic engineering thinking.

proval, (3) provide material procurement data, and (4) furnish construction design and detail to the builders.

After a list is developed, the proposed drawing content is examined closely to see if drafting economies can be realized before drafting begins. We ask ourselves if more than one function of the electrical design can be combined onto one drawing; if we can draw some elements in freehand form rather than as finished drawings; what can be typed rather than hand lettered; what can be reproduced from previous work or other division work; and what can be adequately covered in a specification rather than by drawing. With an approach such as this and with these views in mind, we can measure the value of our electrical drawings.

Essentially, electrical drawings can be arranged into neat groups which dovetail nicely with the construction schedule. Each group generally stands by itself and doesn't depend on others for construction.

One Line and Elementary Diagrams

The one-line diagrams portray the elements of the system power circuit with the protective relaying and metering embodiments (See Fig. 1). This is the grass roots electrical engineering thinking and the bible upon which the job is built. Perhaps these could be scratched out in rough form to put the engineers' thoughts down on paper, but engineering is a team effort requiring designers and draftsmen who need this data in up-to-date form in order to forward the design. Probably no drawings are referred to as often during the course of a job as the one-lines. These drawings, too, can transmit to the client the basic schemes contemplated for his approval. Surely these drawings must be included in the set for any large job and be drawn in sufficient detail to record the engineering development.

Following closely the one-line diagrams are the elementary diagrams or schematics. These are a natural transition from the one-lines for they develop all the detail wiring (See Fig. 2). They tell how many wires are needed from one point to another, how many contacts are required on various devices, how the circuit works, etc. In addition to furnishing wiring data for developing the design, they are often used to inform vendors of equipment how their product is to be wired. These are generally drawn in freehand form on double-letter-sized sheets which have a non-printing grid lined into them to promote a neater drawing. A considerable drafting saving has been realized here, but the need for these drawings is vital. They continue to serve after construction as well, since they provide detail data for checking the wiring during maintenance work throughout the life of the plant.

Physical Installation Drawings

The second group of drawings are those necessary for installation of physical equipment and materials.

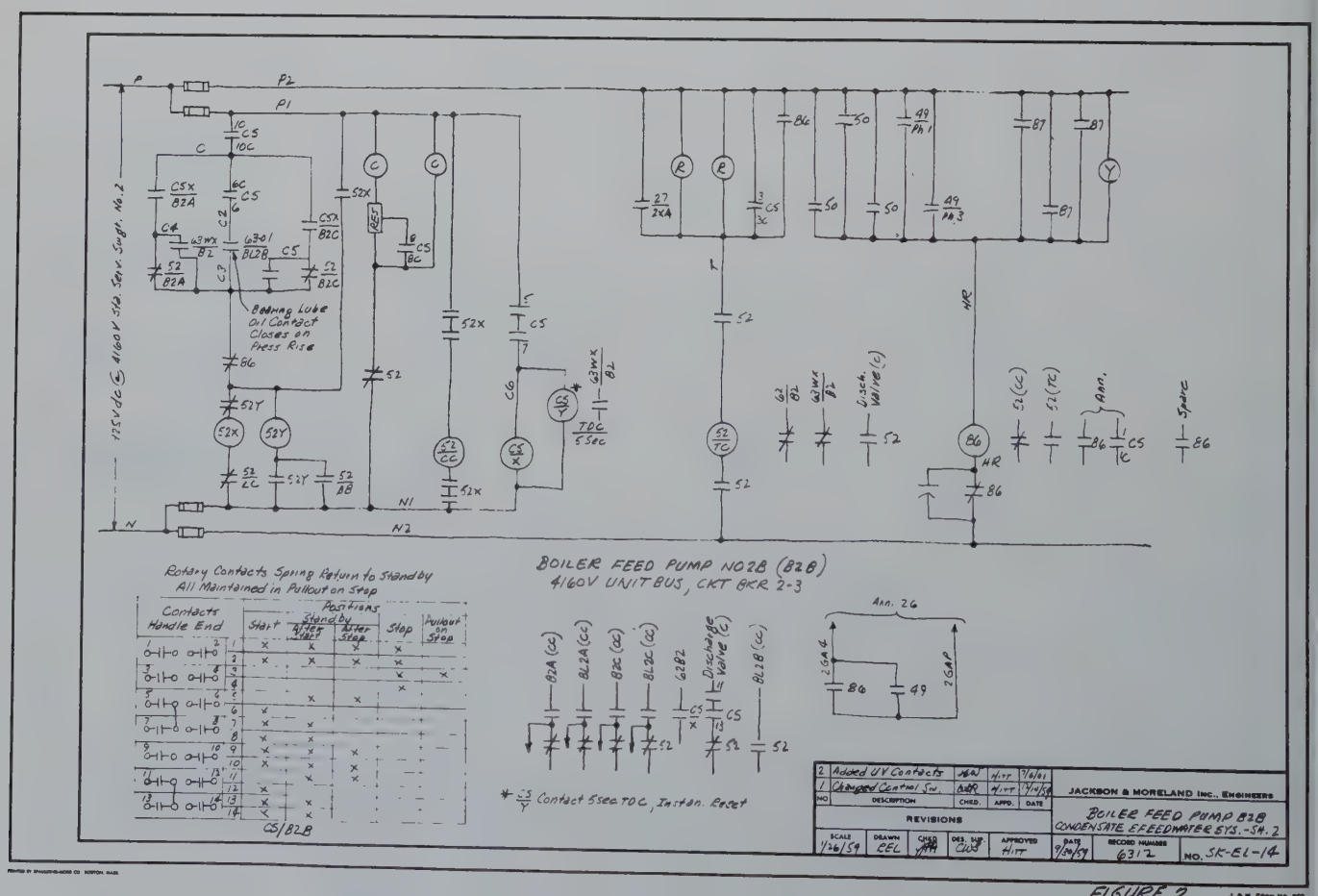
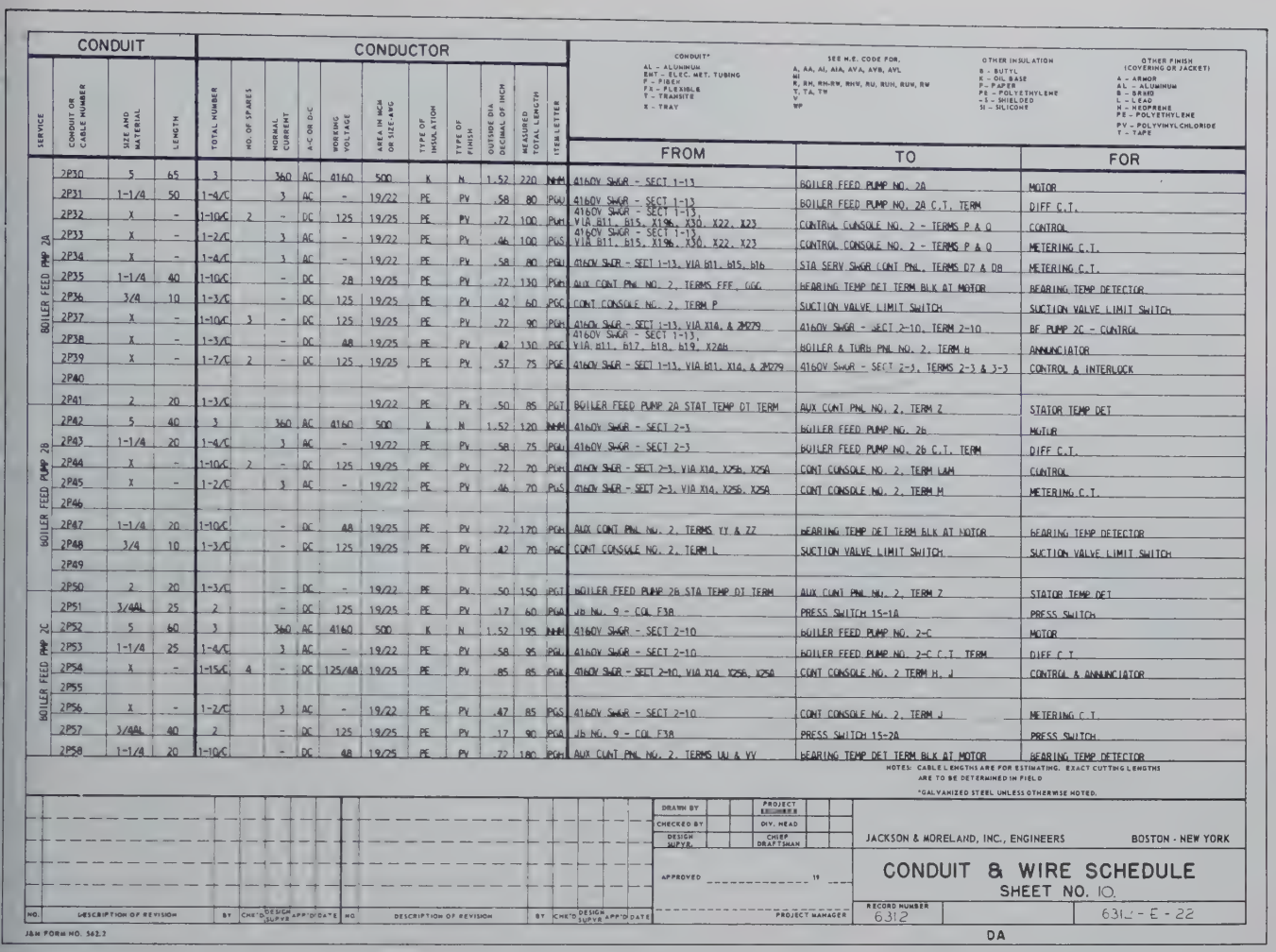


FIGURE 2

FIGURE 2. Schematics are used to develop detail.



CONDUIT

SERVICE	CONDUIT OR CABLE NUMBER	SIZE AND MATERIAL	LENGTH
BOILER FEED PMP 2A	2P30	5	65
	2P31	1-1/4	50
	2P32	X	-
	2P33	X	-
	2P34	X	-
	2P35	1-1/4	40
	2P36	3/4	10
	2P37	X	-
	2P38	X	-
	2P39	X	-
	2P40		
	2P41	2	20
BOILER FEED PUMP 2B	2P42	5	40
	2P43	1-1/4	20
	2P44	X	-
	2P45	X	-
	2P46		
	2P47	1-1/4	20
	2P48	3/4	10
	2P49		
	2P50	2	20
BOILER FEED PMP 2C	2P51	3/4GAL	25
	2P52	5	60
	2P53	1-1/4	25
	2P54	X	-
	2P55		
	2P56	X	-
	2P57	3/4GAL	40
	2P58	1-1/4	20

CONDUCTOR

CONDUIT OR CABLE NUMBER	TOTAL NUMBER	NO. OF SPARES	NORMAL CURRENT	A-C OR D-C	WORKING VOLTAGE	AREA IN MCM OR SIZE AWG	TYPE OF INSULATION	TYPE OF FINISH	OUTSIDE DIA DECIMAL OF INCH	MEASURED TOTAL LENGTH	ITEM LETTER	FROM	TO	FOR
2P30	3		360	AC	4160	500	K	N	1.52	220	NHH	4160V SWGR - SECT 1-13	BOILER FEED PUMP NO. 2A	MOTOR
2P31	4/C		3	AC	-	19/22	PE	PV	.58	80	PGU	4160V SWGR - SECT 1-13	BOILER FEED PUMP NO. 2A C.T. TERM	DIFF C.T.
2P32	10/C	2	-	DC	125	19/25	PE	PV	.72	100	PUH	4160V SWGR - SECT 1-13, VIA B11, B15, X19A, X30, X22, X23	CONTROL CONSOLE NO. 2 - TERMS P & Q	CONTROL
2P33	2/C		3	AC	-	19/22	PE	PV	.46	100	PUS	4160V SWGR - SECT 1-13, VIA B11, B15, X19A, X30, X22, X23	CONTROL CONSOLE NO. 2 - TERMS P & Q	METERING C.T.
2P34	4/C		3	AC	-	19/22	PE	PV	.58	80	PGU	4160V SWGR - SECT 1-13, VIA B11, B15, B16	STA SERV SWGR CONT PNL, TERMS D7 & D8	METERING C.T.
2P35	10/C		-	DC	28	19/25	PE	PV	.72	130	PUH	AUX CONT PNL NO. 2, TERMS FFF, GGG	BEARING TEMP DET TERM BLK AT MOTOR	BEARING TEMP DETECTOR
2P36	3/C		-	DC	125	19/25	PE	PV	.42	60	PGC	CONT CONSOLE NO. 2, TERM P	SUCTION VALVE LIMIT SWITCH	SUCTION VALVE LIMIT SWITCH
2P37	10/C	3	-	DC	125	19/25	PE	PV	.72	90	PUH	4160V SWGR - SECT 1-13, VIA X1A, & 2M279	4160V SWGR - SECT 2-10, TERM 2-10	BF PUMP 2C - CONTROL
2P38	3/C		-	DC	48	19/25	PE	PV	.42	130	PGC	4160V SWGR - SECT 1-13, VIA B11, B17, B18, B19, X24A	BOILER & TURB PNL NO. 2, TERM H	ANNUNCIATOR
2P39	7/C	2	-	DC	125	19/25	PE	PV	.57	75	PUE	4160V SWGR - SECT 1-13, VIA B11, X1A, & 2M279	4160V SWGR - SECT 2-3, TERMS 2-3 & 3-3	CONTROL & INTERLOCK
2P40														
2P41	2/C					19/22	PE	PV	.50	85	PUT	BOILER FEED PUMP 2A STAT TEMP DT TERM	AUX CONT PNL NO. 2, TERM Z	STATOR TEMP DET
2P42	3		360	AC	4160	500	K	N	1.52	120	NHH	4160V SWGR - SECT 2-3	BOILER FEED PUMP NO. 2B	MOTOR
2P43	4/C		3	AC	-	19/22	PE	PV	.58	75	PGU	4160V SWGR - SECT 2-3	BOILER FEED PUMP NO. 2B C.T. TERM	DIFF C.T.
2P44	10/C	2	-	DC	125	19/25	PE	PV	.72	70	PUH	4160V SWGR - SECT 2-3, VIA X1A, X25B, X25A	CONT CONSOLE NO. 2, TERM LAM	CONTROL
2P45	2/C		3	AC	-	19/22	PE	PV	.46	70	PUS	4160V SWGR - SECT 2-3, VIA X1A, X25B, X25A	CONT CONSOLE NO. 2, TERM M	METERING C.T.
2P46														
2P47	10/C		-	DC	48	19/25	PE	PV	.72	170	PGH	AUX CONT PNL NO. 2, TERMS YY & ZZ	BEARING TEMP DET TERM BLK AT MOTOR	BEARING TEMP DETECTOR
2P48	3/C		-	DC	125	19/25	PE	PV	.42	70	PGC	CONT CONSOLE NO. 2, TERM L	SUCTION VALVE LIMIT SWITCH	SUCTION VALVE LIMIT SWITCH
2P49														
2P50	2/C		-	DC	-	19/22	PE	PV	.50	150	PGT	BOILER FEED PUMP 2B STA TEMP DT TERM	AUX CONT PNL NO. 2, TERM Z	STATOR TEMP DET
2P51	2/C		-	DC	125	19/25	PE	PV	.17	60	PGA	JB NO. 9 - COL F3A	PRESS SWITCH 15-1A	PRESS SWITCH
2P52	3		360	AC	4160	500	K	N	1.52	195	NHH	4160V SWGR - SECT 2-10	BOILER FEED PUMP NO. 2-C	MOTOR
2P53	4/C		3	AC	-	19/22	PE	PV	.58	95	PGU	4160V SWGR - SECT 2-10	BOILER FEED PUMP NO. 2-C C.T. TERM	DIFF C.T.
2P54	15/C	4	-	DC	125/48	19/25	PE	PV	.85	85	PGK	4160V SWGR - SECT 2-10, VIA X1A, X25B, X25A	CONT CONSOLE NO. 2 TERM H, J	CONTROL & ANNUNCIATOR
2P55														
2P56	2/C		3	AC	-	19/22	PE	PV	.47	85	PGS	4160V SWGR - SECT 2-10	CONT CONSOLE NO. 2, TERM J	METERING C.T.
2P57	2		-	DC	125	19/25	PE	PV	.17	90	PGA	JB NO. 9 - COL F3A	PRESS SWITCH 15-2A	PRESS SWITCH
2P58	10/C		-	DC	48	19/25	PE	PV	.72	180	PGH	AUX CONT PNL NO. 2, TERMS UU & VV	BEARING TEMP DET TERM BLK AT MOTOR	BEARING TEMP DETECTOR

*CONDUIT: AL - ALUMINUM; EMT - ELEC. MET. TUBING; F - FIBER; FX - FLEXIBLE; T - TRANSITE; X - TRAY

SEE M.E. CODE FOR: A, AA, AI, AIA, AVA, AVB, AVL, MI, R, RH, RH-RW, RHW, RU, RUH, RUW, RW, T, TA, TW, V, WP

OTHER INSULATION: B - BUTYL; K - OIL BASE; P - PAPER; PE - POLYETHYLENE; S - SHIELDED; SI - SILICONE

OTHER FINISH (COVERING OR JACKET): A - ARMOR; AL - ALUMINUM; B - BRAID; L - LEAD; N - NEOPRENE; PE - POLYETHYLENE; PV - POLYVINYLCHLORIDE; T - TAPE

NOTES: CABLE LENGTHS ARE FOR ESTIMATING. EXACT CUTTING LENGTHS ARE TO BE DETERMINED IN FIELD

*GALVANIZED STEEL UNLESS OTHERWISE NOTED.

DRAWN BY | CHECKED BY | DESIGN SUPVR. | PROJECT ENGINEER | DIV. HEAD | CHIEF DRAFTSMAN | APPROVED _____ 19 ___ | PROJECT MANAGER

JACKSON & MORELAND, INC., ENGINEERS BOSTON - NEW YORK

CONDUIT & WIRE SCHEDULE
SHEET NO. 10.

RECORD NUMBER 6312 | 631.2 - E - 22

NO. | DESCRIPTION OF REVISION | BY | CHK'D | DESIGN SUPVR | APP'D | DATE

J&M FORM NO. 562.2

DA

FIGURE 3

FIGURE 3. Conduit and wire schedules give specifications and routing.

The drawings included in this group are:

1. Grounding
2. Duct line
3. Conduit, tray, and bus
4. Lighting
5. Bills of material

These drawings need to be scheduled to coordinate with the field schedule so that installation of the raceway systems, etc., will progress with the project from the ground up. What are the pros and cons of dropping some of these drawings?

Perhaps, for instance, the contractor could be instructed to "ground all equipment in accordance with the National Electrical Code," and the grounding drawings could be scrapped. This would be an easy way to shift some of the cost away from engineering, but isn't the contractor going to have to decide the size of grounding conductors, what equipment to ground, where to run the ground wires, where to terminate them, etc.? And in many instances, there isn't time to wait for answers to these problems in the field. Concrete is being placed and the ground wires must be located. Certainly details of grounding circuits can be overdone, but the theory of abandoning such drawings for a stock phrase inserted in a specification is risky.

Duct line drawings design the routing and grouping of the underground conduits either in the plant yard or in the interior of the building. The data shown on these drawings require close coordination with all other services involved in the project. Careful planning is absolutely necessary to assure that interferences will not occur. The problem of drainage and pulling-in of the cables must be thought out clearly. Short cuts here could result in costs far exceeding the cost of the drawings, although many times the gamble has been made and won.

Conduit, tray, and bus drawings detail the sizing and routing of the raceway system. Here again, the problem of coordination with other trades is essential. Perhaps a table listing the conduit runs could be concocted in lieu of detailed design. The contractor could be left to chose his own routing to the most economical advantage, but the chances of running into interferences are high, and the cost of relocating the conduits or tray even higher.

Lighting can be treated in many ways. A precisely designed job locates all the fixtures by dimension, provides circuit and wire data, and gives a complete schedule of lighting panel loading. Less complete drawings can leave out the conduit runs, dimensions, etc., but all at the expense of shifting the problem over to the contractor. Another economy measure is to draw such plans at smaller scales, thus reducing the number of drawings for a given area.

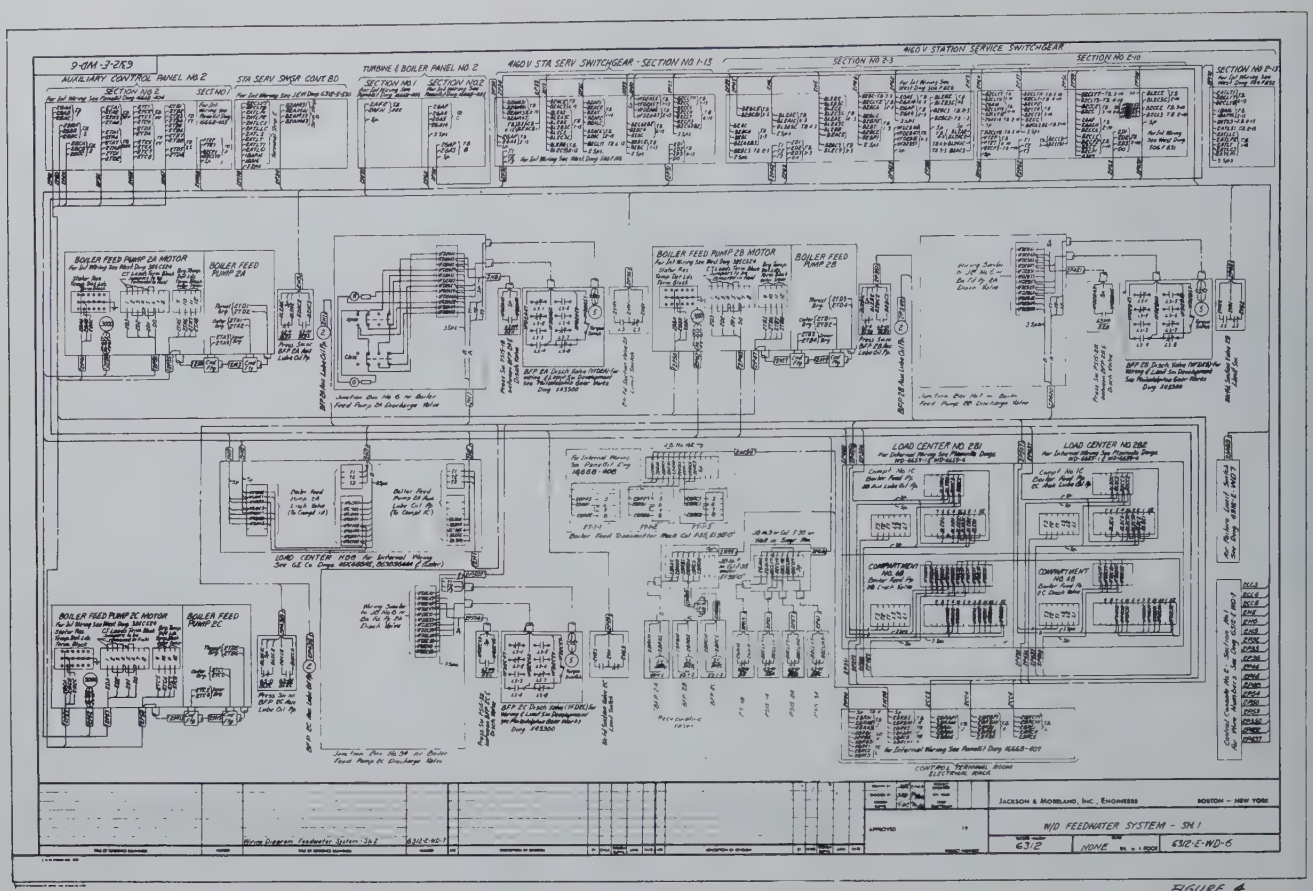


FIGURE 4. Wiring diagrams show how every piece of equipment is connected.

Certainly two drawings covering the same area cannot be drawn as cheaply as one, but the effort of trying to read a small-scale drawing in the field, once it has become dirty from constant use, can offset extra cost in drafting.

Bills of material vary greatly from project to project. In some instances, they can be eliminated entirely and the prospective contractors will each bid on his own take-off. This is as it should be unless control of material is desired by the plant owner. A system has now been developed at J&M, and is working very well, to have bills of material automatically printed out on IBM equipment and at the same time provide accounting features for cost and quantity control. This system relieves the designers and draftsmen of running to find items of material since a master IBM card file has been developed which covers better than 95% of all electrical items required. With features such as this, the engineer is well equipped to provide the extra plus service in engineering which in the long run can result in considerable over-all saving to the project.

Cable and Wire Data

Once the second group of drawings have served their function in the field, the third group are ready for use as a natural step in construction. The second group were self-sufficient if properly drawn, i.e., they required no other drawings to complete their phase of the work, and so the design groups could concentrate on getting only those drawings to the field or out for bidding. Similarly the conduit and wire schedules need no other drawings for their use in the field. These drawings are actually tabulations of the wire and cables that are to be run in the raceways previously installed. They state explicitly what cables or wires are to be run and their routing (See Fig. 3). Some projects do not require this type of drawing since this data can be put onto the conduit plans or even onto the one-line diagram (sometimes drawn as a riser diagram), but on a project of major size, this alternate form is time consuming and will hold up conduit and tray plans while waiting for firm information. With typing machines designed for typing on large, full-size drawings, these schedules can be neatly produced at a minimum cost. Some form of wiring data is essential and these schedules provide a straightforward solution to the installation of the conductors.

Wiring

The final group are the wiring diagrams (See Fig. 4). These show how every piece of electrical equipment on the job (exclusive of lighting) is connected and interconnected. Here again, these drawings stand by themselves and are all that are necessary to finishing up the electrical installation. These drawings may be omitted from the bidding set of drawings, thus allowing latitude for concentrating a smaller force on the group two and three drawings. There are, of course, alternatives to this form of drawing too. Some clients wish to have both conductor and wiring data complete for each cable on a separate letter-sized sheet. This requires considerable paper shuffling on a large project (2,000 or more cables), but results in the simplification of work assignments in the

JACKSON & MORELAND, INC.

MEASURING THE VALUE OF ELECTRICAL DRAWINGS FOR LARGE CONSTRUCTION PROJECTS

USED BY ENGINEER FOR:	TYPES OF DRAWINGS: GROUP 1 — ONE LINE DIAGRAMS	GROUP 1 — ELEMENTARY DIAGRAMS	GROUP 2 — GROUNDING	GROUP 2 — DUCT LINES	GROUP 2 — CONDUIT TRAY & BUS	GROUP 2 — LIGHTING	GROUP 2 — BILLS OF MATERIAL	GRP3 — CABLE & WIRE DATA	GRP4 — WIRING	REMARKS
Recording Basic Engineering Design Concepts	X	X								
Reference During Design Development	X	X								
Obtaining Client's Approval of Basic Design Concepts	X	X								
Determination of Detailed Wiring Data		X								
Material Procurement and Control							X	X		Quantities of Conduit and Wire are on C&W Schedules
Identification of Items of Material on Drawings							X			Bills of Material are IBM Printed on Separate Sheets
USED BY VENDORS OF MATERIAL & EQUIPMENT FOR:										
Learning Specific Equipment Desired							X			
Supplemental Data to Specifications	X	X								
USED BY CONTRACTOR FOR:										
Construction			X	X	X	X	X	X	X	
Material Procurement			X	X	X	X	X	X		Contractor Makes His Own Mat'l. Take-Off on Some Jobs
Reference & Check-Out	X	X								
USED BY CLIENT FOR:										
Approval of Design	X	X	X	X	X	X	X	X		
Records (Insurance, Taxes, Valuation, Later Additions)	X	X	X	X	X	X	X	X		
Maintenance	X	X	X	X	X	X	X	X	X	
Trouble Shooting	X	X		X	X	X	X	X	X	
Operating Data	X	X							X	

FIGURE 5. Summation of worth and use of drawings.

field, since inexperienced help can cope more readily with a single circuit than with the large drawing showing a maze of wiring. Here it is a matter of experience and preference, but wiring diagrams must be provided unless the project is small and the connections simple.

Such is the case for measuring the value of electrical drawings. A summation of the worth and uses of these drawings is shown in Fig. 5. A project well designed and integrated will recognize the need for paper solutions to the problems of modern engineering and design. Leaving it to the field can be an easy spur-of-the-moment decision and may very well result in costly field alterations, and an installation that will be unattractive in appearance and awkward in operation and maintenance.

The Author

CHARLES W. SNOW is a senior electrical engineer with Jackson & Moreland, Inc., 600 Park Square Bldg., Boston 16, Mass., a firm of consulting engineers. Mr. Snow functions as assistant to the chief electrical engineer, oversees design group operations, and assists in general administration of the electrical division.

New Products

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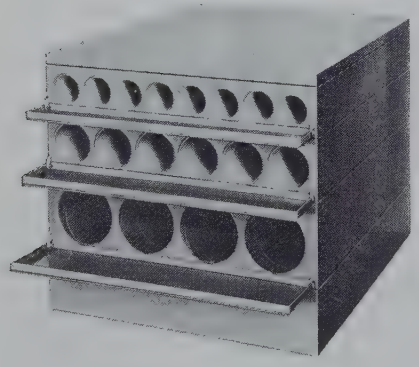
On display at booth 177, VCC.



Filing Equipment

The new Moducor File System of the Hamilton Mfg. Co., Dept. GS, Two Rivers, Wisc., is designed to provide exceptional flexibility in rolled filing equipment with varying tube dimensions to fit every size, type, or activity of stored materials. The system consists of four, six, and eight tube modules of a standard width to permit stacking any size modules for varying storage and activity requirements. Individual tubes are paper laminate, foil wrapped with steel ends for maximum strength, and moisture, smoke, and dust resistance.

On display at booths 86 and 87, VCC.

Reader-Printer

A new microfilm aid to the engineering reproduction field is the Photostat 18·24 Reader-Printer, made by Photostat Corp., a subsidiary of Itek Corp., Dept. GS, 1001 Jefferson Rd., Rochester 3, N. Y., the new unit is designed to produce fast, economical prints from aperture cards or jacketized film. High contrast black and white copies are achieved through the photographic process at the touch of a button. Prints are automatically trimmed to any desired length from 8″ to 24″.

Built-in operating conveniences include simplified paper loading, disposable cartridge chemical handling, a magnification ratio which can be modified to meet special requirements.

On display at booth 165, VCC.

Reproduction Typing Paper

Typing paper especially treated for offset reproduction purposes has been developed and is being now marketed by Fototype Inc., Dept. GS, 1414 Roscoe St., Chicago 13, Ill. A coating of fine white pigment is applied to a bond typing paper to produce in Copy-Prep a brilliant white surface of nonglare matte texture. Unlike enameled stock, this product has a matte finish and cannot throw a reflection into the camera; it also takes ruling pen work without feathering.

Spaced Lettering

A method of insuring perfect spacing in the field of pressure-sensitive lettering is the newest development of Chart-Pak, Inc., Dept. GS, Leeds, Mass. Known as Spaced Lettering, the sets contain one size of letters, numbers, and punctuation marks. They are available in Round Gothic face in 96 pt., 48 pt., 24 pt., and 12 pt. sizes. Each character is individually die-cut from clear, pressure-sensitive acetate for easy application. Intended for use in titles, headings, charts, legends, diazochromes, drawings, and transparencies, the Spaced Lettering may be reproduced through diazo or photographic process.

On display at booths 6 and 7, VCC.

Correction Tape

A blockout correction tape which obviates the necessity for typewriter erasers is now available from Joseph Dixon Crucible Co., Dept. GS, Jersey City 3, N. J. Called Taperaser, the product is designed to block out typing errors. It consists of a paper-like substance, rolled and packaged like cellophane tape, with its underside coated with a white clay and talc mixture. To erase, the typist tears away a strip of the material, places it on the paper at the place where the error has occurred, restrikes the original error, and then types the correction where it should have been in the first place. The company claims this method makes it impossible to detect error or correction.

On display at booth 13, VCC.

Lead Refills

Lead refills for use with lead holders and designed specifically for tracings on polyester-based film are now available as the companion product to the F.T.R. tracing pencil introduced on the market last year. Made by Joseph Dixon Crucible Co., Dept. GS, Jersey City 3, N. J., the F.T.R. leads are packaged in a transparent plastic tube, with a hang-up cap, are manufactured in six degrees of density, with the degree designation clearly marked on each refill container. Free samples are available to those who write on their company letterheads to the address above, attention the Drafting Research Dept.

On display at booth 13, VCC.

Microfilm Jackets

A new line of microfilm jackets is designed to accelerate referral to microfilmed documents or drawings. These jackets permit the convenient grouping of related images, the use of an easily inserted tab index, and the fast retrieval of an entire group of records when required. Available for 16 mm. and 35 mm. film, in a variety of sizes, the jackets are made by Photostat Corp., Dept. GS, 1001 Jefferson Rd., Rochester 3, N. Y.

On display at booth 164, VCC.

(For additional information regarding the new products described here, contact the manufacturer directly. Complete addresses are included.)

DRAFTING TRENDS

New, improved Rotolite Expeditor conveniently makes sepia reproducibles and diazo films in addition to low cost whiteprints.

Make whiteprints in minutes

Here's a new, fast, economy whiteprinter that fills a real need in small drafting rooms or large engineering departments.

Workprints for architects, consulting engineers, surveyors, contractors. The Rotolite Expeditor can handle *all* copying needs for the two- or three-man drafting operation, is always ready to cope with rush jobs, even after hours. With POST Super Vapo Papers, print production can be doubled.

Quick checkprints for larger manufacturers. Even huge engineering divisions with their own reproduction departments praise Expeditor's practical, on-the-spot convenience for quick copies of preliminary sketches, checkprints, conference data, visual presentations. Hundreds of companies have placed Rotolites in their engineering and drafting rooms for "self-service" whiteprints in a hurry.

No preheating or other delays—Rotolite makes prints immediately. There's a choice of three models to take 18″, 27″ or 42″ wide tracings of any length. Rotolite is easily hung on wall or placed flat on a table top, plugs into any standard convenience outlet. With new dial speed control, you can make cloth and film reproductions immediately, as well as paper prints. For fast developing, choose either economical ammonia tube or new, sealed Thermomatic unit, illustrated below.

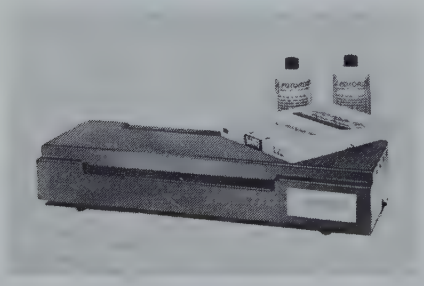
Recommended print materials. Use POST diazotype sensitized products—Vapo paper, sepia vellum, cloth or film—for best results. Get full information on Expeditor and standard Rotolite whiteprinters from your POST dealer or write Frederick Post Co., 3656 N. Avondale Ave., Chicago 18, Ill.

POST

SENSITIZED PAPERS & CLOTHS • TRACING & DRAWING MEDIUMS • DRAWING INSTRUMENTS & SLIDE RULES
ENGINEERING EQUIPMENT & DRAFTING SUPPLIES • FIELD EQUIPMENT & DRAFTING FURNITURE

Upholstered Drafting Chair

A new adjustable drafting chair upholstered in foam is now available in two models, according to height. According to the manufacturer, Toledo Metal Furniture Co., Dept. GS, 1350 Hastings St., Toledo 7, Ohio, the chairs provide scientific control of posture and thus lessen fatigue. Their design distributes the user's weight without restricting circulation under the knees. A choice of five colors of metal is available, the upholstery is green.

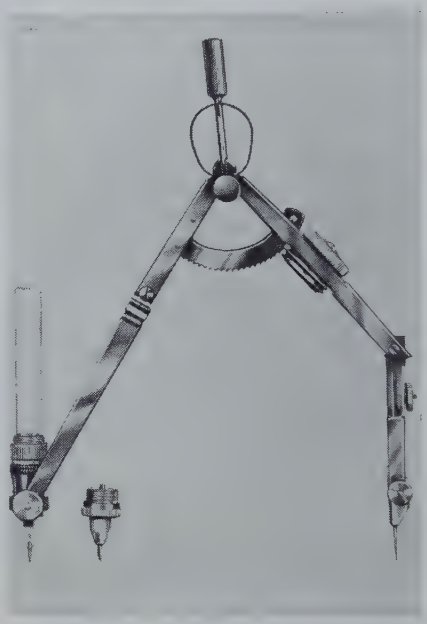


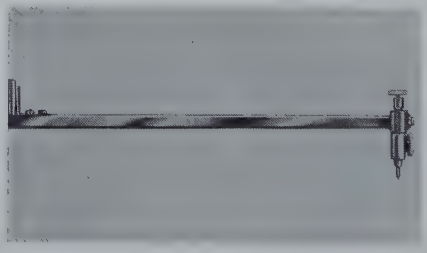
Time Saving Print Process

Fotorite Rapid Print Process produces professional quality semi-dry contact and enlargement prints up to 11" x 14" within 5 to 15 seconds, a time saving of over 40 minutes compared with hand processing. The Fotorite Process consists of a compact table-top Fotorite processor, special new developing and stabilizing chemicals, and new sensitized papers. It is marketed by Fotorite, Inc., Dept. GS, 6424 North Western Ave., Chicago, Ill.

Thermal Copy Paper

A new product on the market is Labelon Thermal Copy Paper, a product of Labelon Tape Co., a division of Labelon Corp., Dept. GS, 10 Chapin St., Canandaigua, N. Y. Designed for use with thermofax machines, the paper has excellent reproduction qualities and runs in the machine at the same range and speed as for regular copy paper, without requiring a filter or screen. A full weight sheet, it is easy to handle and file, will not become brittle or darken with age.





Compass and Beam Attachment

No. 3175, the Koh-I-Noor Rapidograph-Compass, is a precision-engineered ringhead bow compass with a special quick-setting device, to be used with either the Rapidograph drawing point sections or with graphite leads. The beam attachment, No. 3175-B, for making large circles assures uninterrupted completion of even the largest circle because of an ample ink supply in the reservoir. Both compass and attachment are products of Koh-I-Noor, Inc., Dept. GS, Bloomsbury, N. J.

On display at booth 26, VCC.

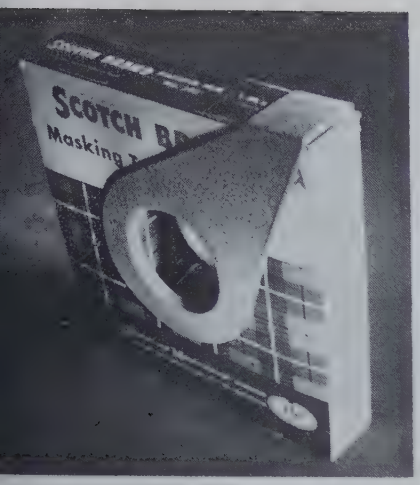
Space-Saving Table

To solve the problem of space taken up by drafting tables, a new space-saving table has been developed by Unitech Corp., Dept. GS., 50 Colfax Ave., Clifton, N. J. Part of the Kuhlmann line and available in silver gray, the new table features a streamlined design and perfect counterbalancing, enabling the draftsman to adjust it to any height or angle at the touch of a fingertip.

Copier 909

A new copier featuring a Ready-Pak developer cartridge which eliminates the mixing and pouring of chemicals is now on the market. Made by Photostat Corp., Dept. GS, 1001 Jefferson Rd., Rochester 3, N. Y., the Office Copier 909 produces high contrast, black-on-white copies from any type of original up to 9" wide by any length. It copies all colors and reproductions are permanent, unaffected by heat, light, or humidity. Distribution will be through Photostat's branches in the U.S. and Canada.

On display at booth 164, VCC.



Dispenser Reinforcement

A new aluminum reinforcement to maintain the effectiveness of the drafting tape dispenser package until the last inch of tape is used is now on the market. Made by Best Yet Products, Dept. GS, 10719 S. Rhodes, Chicago 28, Ill., the reinforcement maintains support for the inside diameter of the tape and prevents the serrated edge of the dispenser from being torn away from the dispenser. When a roll of tape has been used, the reinforcement can be removed and attached to a new dispenser.

Kidjel Ratio Caliper

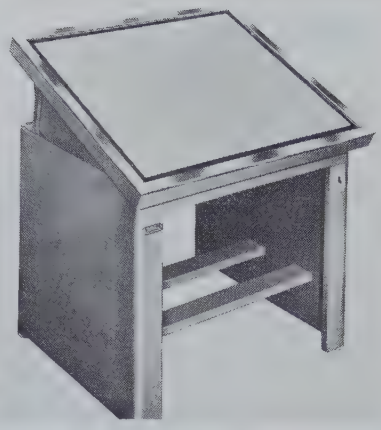
A new and simple tool for determining pleasing proportion and spatial harmony has been developed by Kidjel-Young & Associates, Inc., 1012 Piikoi St., Suite 3, Honolulu 14, Hawaii. The tool is called Cali-Pro, is based on the Kidjel Ratio system, a concept of proportion explained and illustrated in a book called *The 2 Hours That Shook the Mathematical World*, written by Maurice Kidjel in collaboration with Kenneth W. K. Young.

On display at booth 162, VCC.

Technical Illustration

A third edition of Higgins Ink Co.'s successful textbook, *Technical Illustration*, has been in considerable demand in colleges and like institutions. The heavily illustrated book was compiled for Higgins by Anthony D. Pyeatt, publications engineer, Nike Systems Project Office, Douglas Aircraft Co., Inc., Missiles Engineering Dept. It is a completely modern exposition of technical illustration with particular application to industrial manuals.

On display at booth 140, VCC.



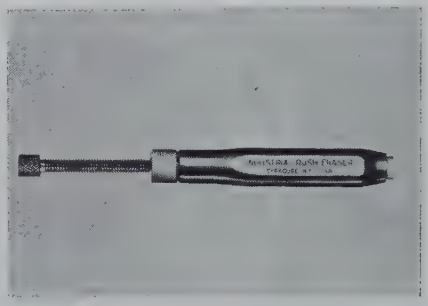
Layout and Viewing Tables

Newly designed layout and viewing tables are available from Leedal, Inc., Dept. GS, 2929 S. Halsted St., Chicago 8, Ill. The tables allow two people to work comfortably at one time sitting or standing. Use of a special unbreakable light-diffusion material permits the tops to be made of clear glass which, if broken, can be replaced at any glass shop at a low cost. Feet and edges are adjustable and the florescent tubes are easily adjustable. The tables come in six sizes, as well as a tilt-top model.

Step-And-Repeat Machine

Misomex, a Swedish-manufactured precision step-and-repeat machine, is now being distributed by the Royal Zenith Corp., Dept. GS, 180 Varick St., New York 14, N. Y. Manufacturers of microminiaturized components for electronic circuitry utilize automatic step-and-repeat photography to facilitate rapid, accurate production of these critical parts. The method is used to achieve multiple identical images from a single piece of original artwork. Misomex machines with fully automatic push-button controls are available in copying area sizes of 25″ x 26″ and 29″ x 43″ and will accommodate original negatives up to 9″ x 12″ in size.

On display at booth 225, VCC.



Fiberglass Eraser

Erasers made with tiny strands of fiberglass bonded together with a solution which allows a higher range of flexibility than would otherwise be possible are now available. Called FybRglass Eraser, this product is made by The Eraser Co., Inc., Dept. GS, 1068 S. Clinton St., Syracuse 4, N. Y. It has an anodized aluminum case with a heavy duty propel-repel FybRglass cartridge.

Color Layouts

Layouts can be made in color and sharp, clear prints made on any blue print machine with Planprint, a custom-made layout service. Planprint is made to reproduce the customer's buildings and facilities and delivered ready to use. Free samples are available from the manufacturer, Planprint Co., Dept. GS, Chalfont, Pa.

Office Copying Machine

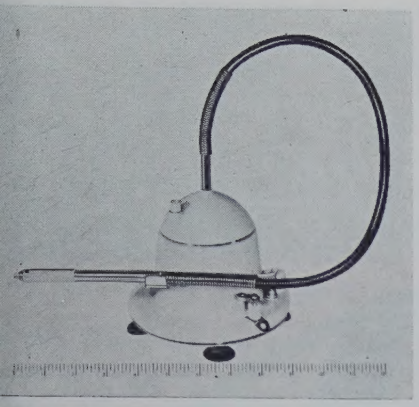
Called Duet, a two-in-one approach to copying needs, is the copier designed to handle every chore at a minimum cost. It is designed especially for office systems work, works in team with Copyflex diazo process. The Duet is a product of Charles Bruning Co. (Canada) Ltd., Dept. MGS, 37 Advance Rd., Toronto 18, Ontario. Simple in design and easy to operate, the Duet contains a dual-purpose exposure unit convertible to either diazo or photocopy at the flick of a switch, and a complete diazo process unit with a top speed of 12′ a minute. The upper section contains a complete photocopy processing unit also geared to 12′ a minute. All three units are controlled by a single, graduated knob.

On display at booth 1, VCC.

New Art Fabric

A new art material with three-dimensional characteristics, for use with water colors and inks, is being introduced to buyers. Neither a paper nor a cloth, the fabric, No. 8400, is a combination of bonded textile fibers that provide controlled penetration of media. Texture encourages vertical absorption of painting media, giving colors in depth rather than a blotter effect. It can also be used for etching, silk screen, wood cuts, and linoleum block printing. The material comes in 12-sheet pads, in two sizes: 15″ x 19″ and 19″ x 23½″. It is available in both medium and heavy weights. 3M brand art fabric is a product of Minnesota Mining & Manufacturing Co., Dept. GS, 900 Bush Ave., St. Paul 6, Minn.

On display at booth 116, VCC.



Electric Eraser

After three years of testing, the Margo Co., Dept GS, 8900 Woodland Ave., Cleveland 4, Ohio, has put on the market an automatic electric eraser called Erasomatic. Designed to eliminate smudging and the need for slip sheets and erasing masks, the new eraser works on pencil, ink, typewriting, and printing. Accurate control is produced by smooth, constant speed and power, and by the one-hand operation of a pencil-like handpiece. The motor starts when the handpiece is lifted from its cradle, and a night lock prevents its being started accidentally. A built-in sharpener-trimmer requires only a simple motion to produce a sharp edge for extreme accuracy. The Erasomatic is claimed to be so gentle in action that there is no paper damage.

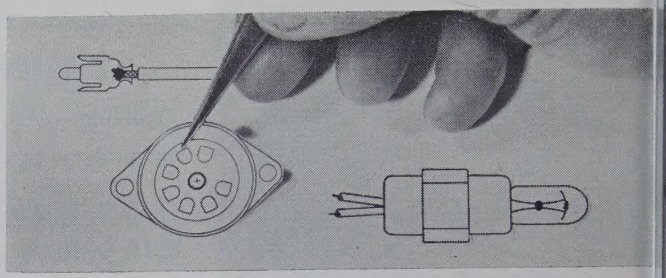
Drafting Table

Torsion Auto-Shift is the name of the new drafting table manufactured by Hamilton Mfg. Co., Dept. GS, Two Rivers, Wisc. The table is of a completely new design based on the company's Auto-Shift principle and offers the latest in productive efficiency and contemporary styling, according to the manufacturer. The drawing board tilt mechanism allows complete board counterbalance through the use of a torsion bar. Since the board position is completely adjustable, the draftsman can work in a comfortable position at all times. Combined drawing and reference facilities are in one unit to save floor space.

On display at booth 86, VCC.

Photocopy Machine

A new desk-top size electrostatic photocopy machine, called the 33, is claimed to produce dry, print-perfect copies faster, and at a lower cost per copy, than machines currently on the market, according to the manufacturer. Not yet in production and on the market, but expected early in 1962, the machine is the product of Smith-Corona-Marchant Inc. Dept. GS, 410 Park Ave., New York 22, N. Y. The electrostatic process is an improved method of producing inexpensive office copies, and utilizes a sensitized paper which is electrically charged, exposed, and developed. Copy paper is automatically fed from a storage rack inside the machine. Movement of the copy and the original is synchronized and on completion of the process both are deposited in a convenient opening at the front.



Custom-Made Layout Aids

Adhesive-backed, transparent photo-reproductions of repetitive elements of drawings are now being custom made by PlanPrint Co., Dept. GS, Chalfont, Pa. Called Draft-Eze, this new product offers the benefits of photo-mechanical drafting with no additional equipment in the drafting room. It vastly reduces drafting man-hours and elapsed time, and assures drafting uniformity wherever repetitive drawing elements appear. Photo-copied from customers' originals on stable polyester film backed with a special non-aging, pressure-sensitive adhesive, Draft-Eze are reuseable indefinitely. The image is completely opaque. Portions of the image may be selectively deleted, and the surface is receptive to pencil and ink. Draft-Eze sheet size is 10" by 12".

Advertising Index

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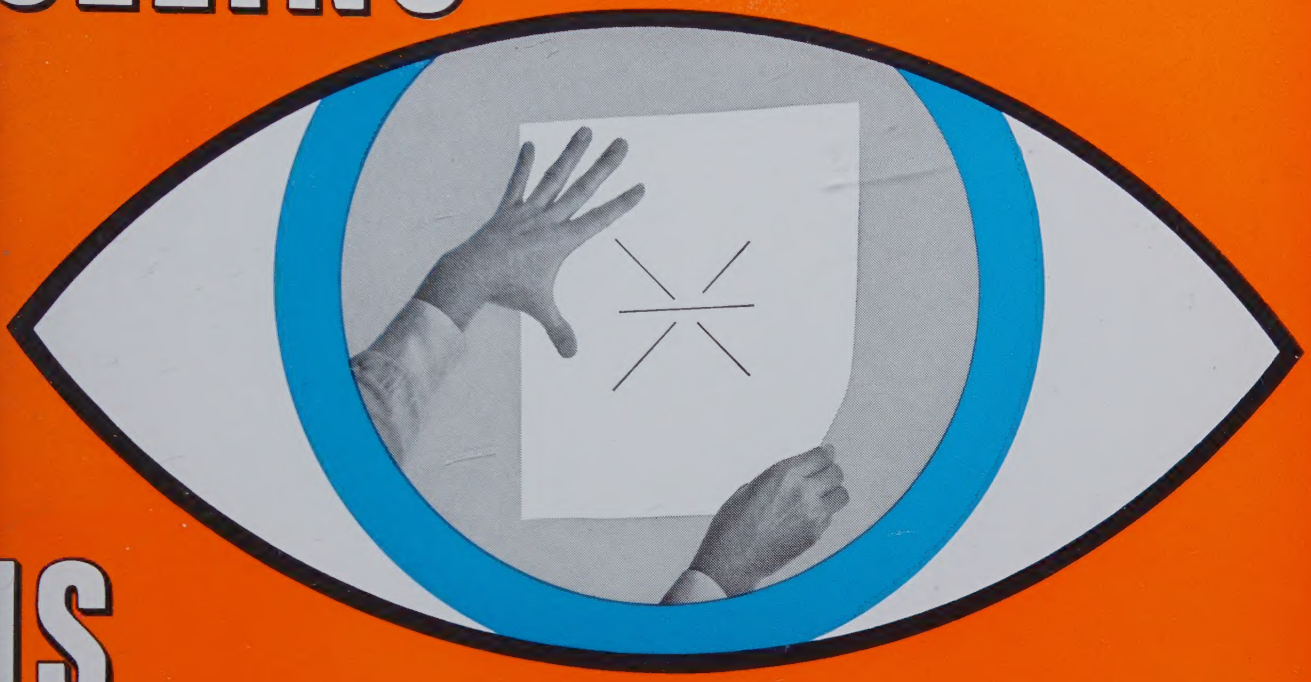

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   Try Clearprint's perfect working surface with a 2H pencil, then with a ruling pen. Lines are sharp and clean—no feathery edges.
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   NO GHOSTING – Erase some of the lines. Redraw and erase several of them time and again. Crease the paper, too. Then hold it to the light, or make cleanest possible reproductions.
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   Sheets in use for 27 years prove Clearprint's amazing stability. Its strength, transparency and printing qualities remain unchanged after extended exposure to age, atmosphere, heat and light. ITS COLOR DOES NOT CHANGE.

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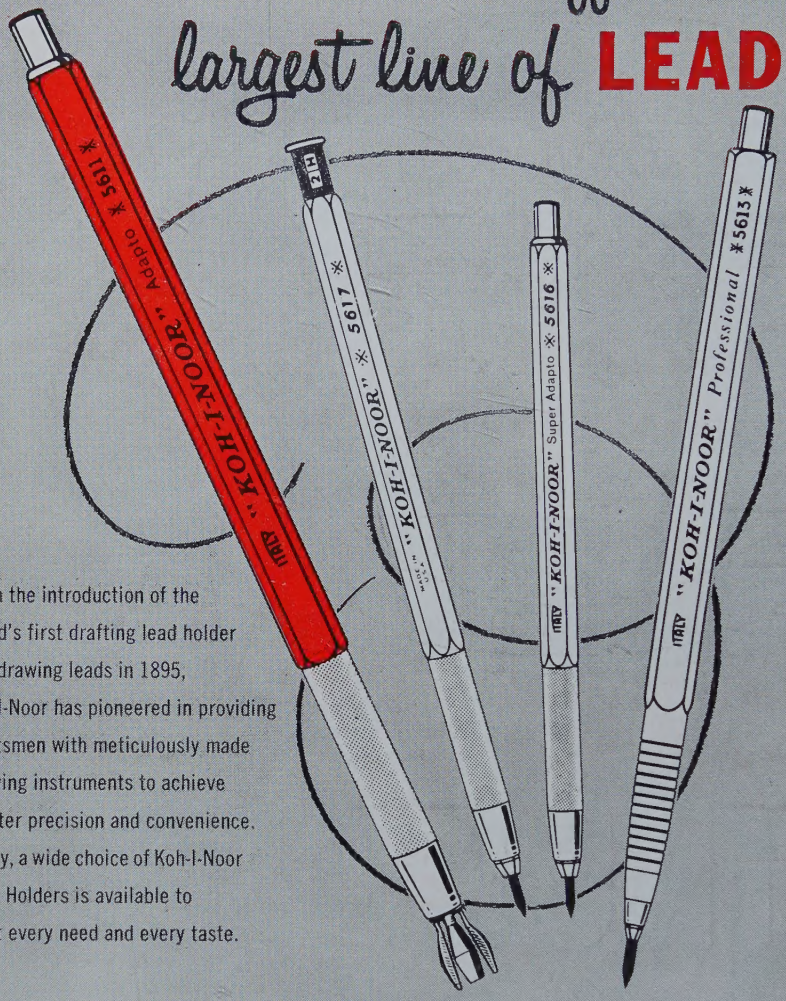
KOH-I-NOOR offers the world's largest line of LEAD HOLDERS



From the introduction of the world's first drafting lead holder and drawing leads in 1895, Koh-I-Noor has pioneered in providing draftsmen with meticulously made drawing instruments to achieve greater precision and convenience. Today, a wide choice of Koh-I-Noor Lead Holders is available to meet every need and every taste.

No. 5611—All metal, balanced, lightweight, with knurled finger grip. Patented "Adapto-Clutch" holds complete range of lead diameters. Replaceable clutch is non-turn, non-slip. "Color-Coded" push button identifies lead degrees.

No. 5617—Non-slip, non-turn "Adapto-Clutch" takes all diameters in 17 degrees of lead. Push button control has built-in degree indicator. Perfectly balanced, with knurled finger grip.

No. 5616—Same as No. 5617 above, but without built-in degree indicator.

No. 5613—New, lightweight, low priced, quality holder, perfectly balanced, with non-slip, non-turn replaceable clutch.

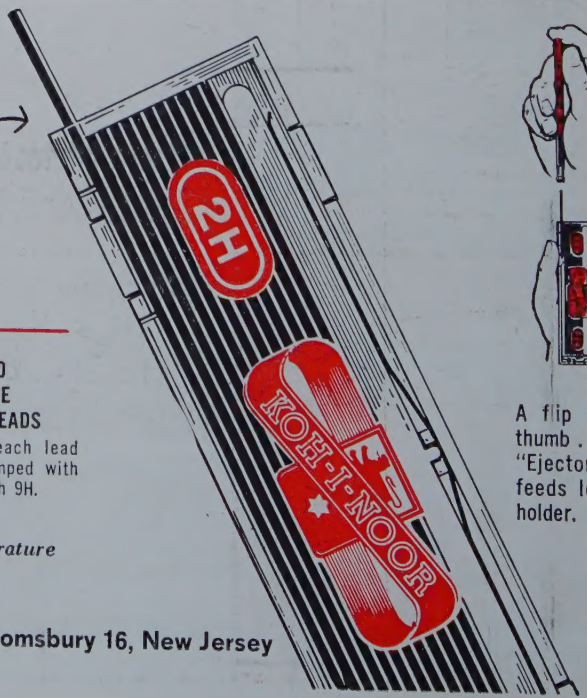
and DRAWING LEADS...

No. 2200-M
KOH-I-LAR
PLASTIC LEADS
Six degrees (6H, 4H, 2H, HB, B, 3B) for use on DRAFTING FILM, in Ejectomatic Dispenser.

No. 2200-I
NEW EJECTOMATIC
LEAD DISPENSER
A flip of the thumb feeds lead from this compact plastic dispenser to the holder, cleanly without need to touch lead. Available in 17 degrees of graphite and 9 colors.

No. 2200-D
DUETTE
Handy plastic slide-top box contains 2 sharpened and imprinted leads of a degree. Available in all 17 degrees.

No. 2200
GRAPHITE
DRAWING LEADS
Six to a box, each lead pointed and stamped with degree. 6B through 9H.



A flip of the thumb . . . and "Ejectomatic" feeds lead to holder.

Write for Descriptive Literature

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